

The Iron Age

A Review of the Hardware and Metal Trades.

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Weimer's Suspended Pipe Hot-Blast Stove.

We show in the accompanying illustrations the suspended pipe hot-blast stove lately introduced to the iron trade by the Weimer Machine Works, of Lebanon, Pa., and which promises to be a successful rival of the costly fire brick stoves of Cooper and Whitwell. The new stove excites much attention amongst metallurgists visiting our Centennial Exposition, where a model, one-fourth size, is displayed in the United States Government Building.

The principle of suspending pipe in the chambers of our hot-blast stoves, is, undoubtedly, correct, as the tendency to warp and "bend over," so destructive to the standing pipe stove, is effectually corrected, thus imparting greater durability to the pipes, and, consequently, longer life to the blast heating plant of a furnace.

Based on a correct principle, the general arrangement and details of Mr. Weimer's stove have been carefully worked out, and every object appears to have been attained that is essential to a thorough and complete success.

The air circulation through the pipes is the same as practiced in our best stoves, passing through one-half of the number of pipes, and returning through the other half. The only objectionable feature of this system has been the tendency of the heat to draw to the hot side of the stove, and destroy the pipes on that side. Mr. Weimer, as will be seen by the illustration, meets this objection by throwing a central wall into the pipe chamber, which, in connection with the two combustion chambers, allows of control of the heat passing to each set of pipes. The amount of gas, and, consequently, the amount of heat admitted to either chamber, insure a uniform temperature to both sides of the stove. As the most rapid oxidation of the pipes takes place immediately above the floor of the pipe chamber, Mr. Weimer does not allow his pipe to come within three feet of the floor, but the space of chamber lost here is doubly compensated for by the pipe filling the usual vacant space under the roof. As no bed pipes or mains are used the metal used in their construction is saved, and every facility is afforded to make the communicating flues between the upper and lower chamber ample and properly distributed. The joints of the pipe are planed to a surface and secured by key bolts, and as they are outside of the stove, a new pipe can be substituted for a disabled one in less than one hour's time, without necessitating going into the stove, or even lowering the temperature of the lower chamber. This great facility of repair is one of the features of the new stove, together with the fact that no joint is exposed to the action of the heat, nor are there any cement joints to blow out. The roof of the stove is formed of pieces of brick cut to fit into and rest on the collars cast on the pipe to receive it. This makes a very cheap and durable roof, which can be easily removed in part for repairs of pipe when necessary.

As will be noticed, the pipes are suspended from 15 inch wrought iron beams resting on plates on the side walls of the stove. The suspension bolts are attached to lugs cast on the pipe, and pass through a saddle placed over the 15 inch beam, being secured by keys. Provision for dusting the pipes is made by the holes in the side walls of the stove, through which an air pipe is inserted.

Mr. Weimer claims that he has produced an unexceptionable pipe stove, and his large experience in all departments of blast furnace engineering has enabled him to perfectly adapt his device to the wants of the iron trade. The specification of Mr. Weimer's patent, in which all the details of construction are fully described, will be found in *The Iron Age* of April 27th, 1876.

Improved Grate Bars at the Centennial.

The subject of grate bars, although not a very interesting one to the general public, is nevertheless of very great importance to those using steam boiler and other furnaces. As there are several very important features which are absolutely essential in the construction of a really good grate bar, which appear to be entirely overlooked by many of the manufacturers, and but imperfectly understood by the unskilled engineers, who are but too frequently entrusted with the charge of steam engines and boilers, a few remarks on the subject may prove of interest, particularly to those who have to bear the expense incident to the use of badly constructed grates. At the convention of the English Institute of Mechanical Engineers, held in Liverpool, the president, Mr. Siemens, stated that fully 50 per cent. of the coal produced in England annually was wasted by imperfect combustion and the admission of cold air to the furnaces. Although results obtained in England cannot be taken as a criterion for this country, yet, even allowing for the saving effected by recent improvements, the loss cannot be estimated at less than from 30

to 25 per cent. Unquestionably the most important consideration is the admission of the proper supply of air through the fire (both as regards quantity and uniformity of distribution) necessary to maintain as nearly as possible a perfect combustion. In this the construction of the grate in regard to the amount of air space proportionate to the total area of fire surface is the point to be considered. Again, we have to take in account the labor required in keeping clean fires, as well as the perhaps more important considerations of loss of heat, and the unequal expansion and contraction of different parts of the boiler, caused by the unavoidable admission of cold air by having the furnace doors open for any considerable length of time while cleaning or slicing fires. The grate bars in themselves constitute a by no means inconsiderable item of consumption in the unimproved forms, as they burn out so rapidly as to require frequent renewal, which necessitates keeping a constant supply on hand, and the expenditure may be reckoned in pounds of castings at so much per lb. per month. This is particularly the case in the furnaces of marine boilers, as shown by the frequent entries of expenditures for grate bars in the steam log books. The saving in first cost and in ease of

of a comparative test ordered by Mr. W. W. Wood, chief of Bureau of Steam Engineering, United States navy, which took place in March, 1876, at Boston Navy Yard, was as follows:

	Ordinary.	Ryder.
Rate of combustion per square foot of grate.....	7.67	9.101
Rate of evaporation per pound of coal.....	10.325	10.754
Total evaporation during trials, 302,800	235,300	
Total consumption of coal during trials.....	33,600	28,000

This shows conclusively that a more perfect combustion was attained through the Ryder bar, and a consequent saving in time of evaporation of 17 per cent.

G. L. SMITH'S PATENT GRATE, manufactured and exhibited by W. W. Tupper & Co., of New York. These bars are composed of two sides, connected by V shaped ties, which are light but strong, and give a very large amount of air opening, while for the smaller kinds of fuel the openings are close enough to prevent waste. In using such fuel as pea coal, screenings, slack, &c., a large supply of air is absolutely necessary to support combustion, more, in fact, than can be admitted through the ordinary forms of grate, hence the

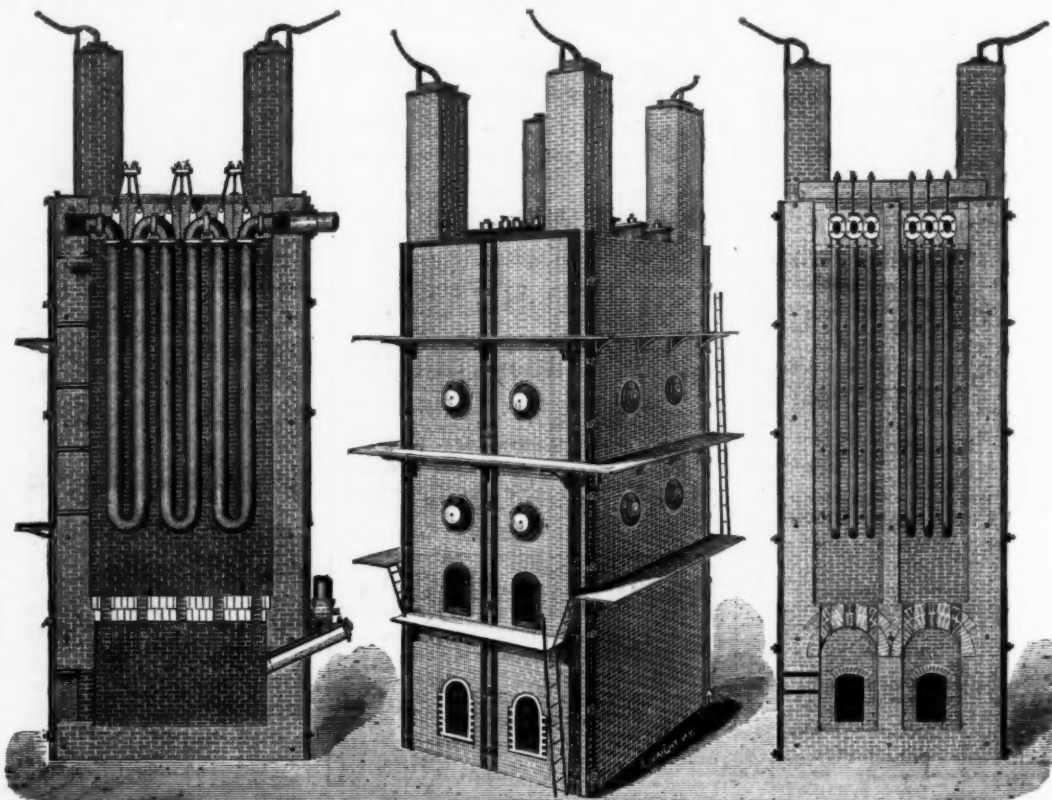
of free trade, whereas other provinces, where iron is the staple trade, wish the abolition of the iron duties proposed next year to be still further deferred. The examining of all the opinions and wishes expressed by the chambers of commerce in detail will be a laborious but necessary task of the Imperial government, and an equalization of the different proposals seem the more possible, as they are based on the whole on the urgency of renewing the existing treaties. The German chambers of commerce entertain on this subject the same opinion as the representatives of French commerce and industry, who all, with the exception of Rouen, at the demand of their government expressed a desire for the renewal of the treaties of commerce.

Baird and Napier.

We now live in the Iron Age. Iron is the material in which almost all our works are executed. It transports us from place to place by sea and land; it is the material of our ponderous structures, of our most delicate instruments, and our most beautiful ornaments; it is the universal necessity of modern life, not only in this country, but the world over. Yet this

helps to success except such as a simple but godly education afforded. The brothers were united among themselves, and were all endowed with the same good qualities of intelligence and industry. The tilling of the soil did not afford scope enough for their ambition. They began with coal mining, and prospered as only the hard worker is able to prosper. Then they added iron mining to their trade, but it was a long and arduous conflict against prejudice and difficulty. If work was to be done it was done by their own hands; if defects were to be removed, they were surmounted by patient experiment, which recognized no such word as failure in the vocabulary. And in due season they had their reward. Their manufacture of pig iron was of the highest quality; their brand became the hall mark of excellence, and the demand for their produce grew with the advancing necessities of the time. But the proprietors of the Gartsherrie Works did not rest content with prosperity when it dawned upon them. Every new improvement was rapidly utilized, and they have not experienced the fate of many early successes—that of being left behind in the race by young and more enterprising competitors. Their position is still as pre-eminent as at any previous stage, and those who recall the changes which 50 years have witnessed in the iron trade, know that this result can only have been secured by constant adaptation to changing circumstances. James Baird was the master spirit of this great firm. He worked at the early pits underground; with his own hand he built the first smelting furnaces in Gartsherrie. His fertile brain devised many ingenious means of increasing production, improving quality and economizing labor. He won success and real wealth; and, rarer incident, he used his position with a sense of conscious responsibility. Wherever he gathered men together as his servants he provided them with the means of spiritual grace; he gave them the same sound education whose blessings he had experienced, and in later years he bestowed on the church, of which he was always a dutiful son, the most munificent gifts the world has chronicled.

The story of Robert Napier is more diversified, but it contains the same leading features of industry, ingenuity and restless anxiety to advance. The Monkland farmer's sons took to the digging of coal and ironstone out of the bowels of the earth, and converting the ironstone into pig. The Dumbarton blacksmith's son employed himself in the manipulation of the smelted iron into implements of commercial utility. He commenced in a humble way in Glasgow as "blacksmith and millwright," but he was not satisfied with this small sphere. He then employed himself in the casting of iron water mains, which were a grand advance on the hollowed trees with which our forefathers were contented. Then he advanced from the repairing of engines to their construction, and was one of the earliest to recognize the uses of the steam engine for marine propulsion. His name will be forever associated with the designing and construction of marine engines; at first on a humble scale, but as experiment followed experiment, with the most stupendous engines that have ever been contrived. Liverpool has a close identity with his labors, and has profited by them more perhaps than any other community. It was Napier's engines that propelled the first steamers that traded between Liverpool and Glasgow; and he was one of the originators of the fleet which first established regular steam communication between Liverpool and New York, and which has now developed into the unrivalled Cunard line. Surely it was no ordinary man who in the early days of steam navigation engineered the Vulcan and the other tiny traders between the Clyde and the Mersey; who in the next stage engineered the Britannia, the Arcadia and the other pioneers of transatlantic voyages; and who in the still later days of progress built hull and engines of such vessels as the Persia, the Scotia and the China. But his industry was not restricted to the mercantile navy; he also constructed troop-ships, stately men-of-war, floating batteries, and armor plated vessels of the most ponderous dimensions. There is a wide range between the small steamers which the Messrs. Burns first employed between Liverpool and Glasgow, and the floating palaces which they now employ on the Atlantic ferry; there is scarcely less width of range between the now antiquated Erebus and the invincible Black Prince, Hotspur, etc., which in succession have been built at the Govan building yard. Yet these unparalleled advances have been accomplished in one man's lifetime, almost by one man's unaided ingenuity and skill. The narrative is a suggestive one. It tells of the rapid strides which modern progress has made; it tells also of the heroes of the conflict, and of their splendid triumph. James Baird and Robert Napier played conspicuous parts in the heralding and the advent of the Iron Age, and in their death the world mourns benefactors whose labors have enriched all men, and augmented the sum of human happiness. —*Liverpool Courier*.



WEIMER'S SUSPENDED PIPE HOT-BLAST STOVE.

handling makes evident the desirability of using in their construction the smallest weight of metal consistent with the required strength. Quite a number of improved grates are exhibited, both in Machinery Hall and in operation under the boilers supplying power to the machinery. Among those worthy of notice may be mentioned

"RYDER'S RECIPROCAL GRATE," exhibited by the Ryder Reciprocal Grate Association, of Taunton, Mass., in space D. 9, col. 68, and also in operation in boiler houses Nos. 3 and 4. As indicated by the name, the grate belongs to that class in which cleaning the fires is effected by motion of the bars or rings of which it is composed. There are two distinct sets of bars, one of which is stationary, and the other having a reciprocating motion, which is both rectilinear and vertical. They are supported by bearing bars, at the ends only, the front one of which is supplied with a simple and effective mechanism, operated by a hand lever for working the movable bars. The latter work on friction rollers, which render the operation easy, even under a very heavy fire. Both the stationary and working bars are cast in pairs, the spaces and thickness of metal being calculated to give admission to the proper supply of air, and is necessarily varied to suit the different kinds of fuel. Each bar is toothed, so that the grate presents a serrated surface, which, by giving a hold on the bottom of the fire, more effectually removes ashes and breaks clinkers, so that they will readily pass through the openings. The operation of the grate is so effective that the necessity for using a slice bar is entirely obviated, and the furnace doors need never be opened except for the purpose of feeding the fires. By having the grate slightly higher in the center, the motion keeps the fires perfectly level and of uniform thickness, and leaves no gaps nor holes around the edges or in the corners, which, by the admission of air where no combustion is taking place, is a very serious result of unskillful firing, often occurring where stationary grates are used. The result

necessity of considering all slack as waste, and as on steam vessels particularly the percentage of slack is often very large, the value of a grate which will utilize it is obvious. The fires can be cleaned very quickly by simply passing a T shaped slice bar over the top of the grate, the angular form of the ties breaking the clinkers and preventing ashes from sliding on as straight parallel bars. The large amount of air passing through all parts of the grate keeps it cool and prevents burning the iron, thus insuring the point of durability. The troublesome feature of jamming from side expansion of the bars is obviated by the flexibility of the angular ties.

THE ADAMS SHAKING GRATE, manufactured by Samuel S. Bent, Globe Iron Foundry, New York, is exhibited in operation in boiler house No. 4. It is composed of two longitudinal bars to each section, connected by straight ties and having lateral projections on each side, placed so as to come opposite the centers of the spaces of the alternate bars. The shaking is effected by imparting motion lengthwise to the end bearing bars, which gives an independent oscillating or rocking motion to the grate bars, which is very effective in removing ashes and clinkers.

Beside the grates described there are several exhibited in Machinery Hall, of which, as there appears to be no attendant in charge of them, it is impossible to obtain any particulars. Among them may be mentioned the "Balance Renovating Grate," Exeter Machine Works, Boston, and L. B. Tupper's grate, New York.

The Free Trade Question in Germany.

It appears that owing to the approaching expiration of the commercial treaties of Germany with other states, a committee of German chambers of commerce has been soliciting opinions upon the subject of their renewal from other commercial bodies, the result of which is an almost general expression in favor of free trade. With especial reference to the iron department, the Chamber of Commerce of Remscheid is desirous for an unequivocal introduction

marvelous development is the growth of a comparatively short space of time. It is only now that the great masters who originated and perfected the transition are passing away. Two of the most remarkable of them have just been gathered to their rest. As we read the memoirs of James Baird and Robert Napier, the mind falls to realize the vastness of the strides which those manufacturers have made within the span of their lives. But they were not silent or passive witnesses of the change which others effected—mere idlers in the world of progress. They played leading parts in the great drama of industrial progress, and saw their labors crowned with a success which, in their wildest dreams, their imagination could not have forecast. They followed the sure path to fame and prosperity; each new advance was only the stepping stone to something greater, and their restless spirit acknowledged no such attribute as finality. Both were identified with the manipulation of iron; each labored, however, in a distinct sphere; and each not only witnessed but produced a revolution in his special department. The Bairds were associated with the production of the crude metal, and Napier with the fashioning of it into wonderful engines of human economy. Each in his department carried his work to the fullness of perfection—not by one grand achievement, but by a long series of patient improvements, worked out with laborious care and consummate ability. These men were contemporaries, almost fellow-townsmen, and they shed luster and wealth on their own district and the world.

The Gartsherrie Iron Works are of worldwide fame, but those gigantic works are the creation of one generation of men. They had a humble beginning, and were born amidst difficulties and obstacles that would have crushed out less persevering men than the Bairds. Indeed, that family had no advantages in their favor except their natural gifts of courage, perseverance and indomitable industry. They were not even trained to the business of iron making. They were a farmer's sons, with no

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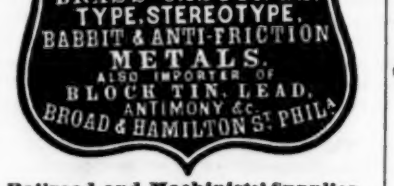
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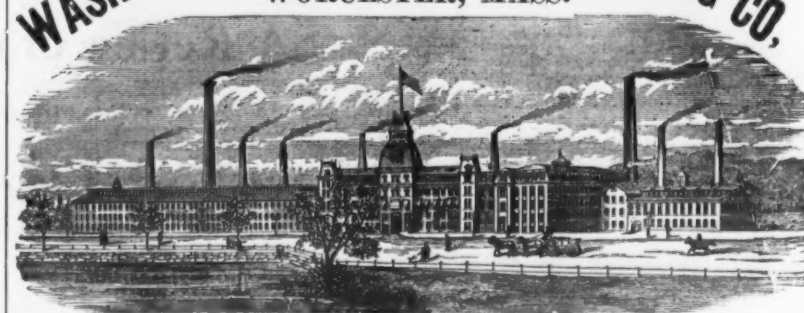
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**FISHING TACKLE, CHALK & FISHING
LINES, FISH RODS, PILES, LEAD-
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Fly Bods are the best in the world.
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Price Lists to the Trade only on application.

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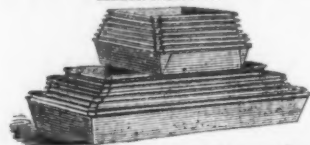
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All warranted the Best Solid Cast Steel.

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Also Cold Rolled Sheet Iron, Bar, Sheet
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Steamboat and Locomotive Gongs kept on hand. A
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These goods we warrant not
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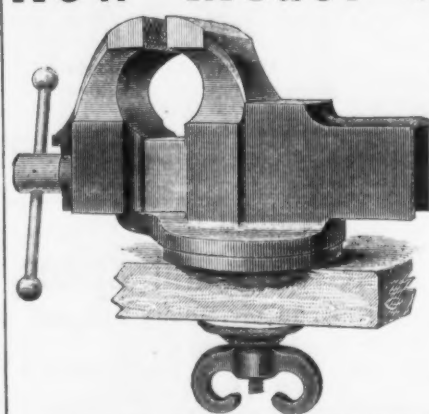
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**UNION METALLIC CLOTHES LINE
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The highest price paid for Cattle's Tails and Hog's Hair
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ICE CREAM FREEZER

(Tingley's Patent)
For Saloons, Hotels, Families or Ice Cream Manu-
facturers, in the economy and
perfection of its work, is en-
tirely unequalled. The
closed head will save ice
enough in one season to pay
for the machine. The tub
requires but one filling to
freeze. Size, 3 to 40 quarts.
Visitors are cordially invited, when in town to the Big
Exhibition, to come and see it, or send for descriptive
circular and price list. Very liberal arrangements
made with the trade. The machines can also be seen at
the Centennial Exhibition, Agricultural Hall, Cor.
Avenue 9 and N. Column letter O, No. 20.
O. C. BLATCHLEY, Manuf., 56 Commerce St., Phila.

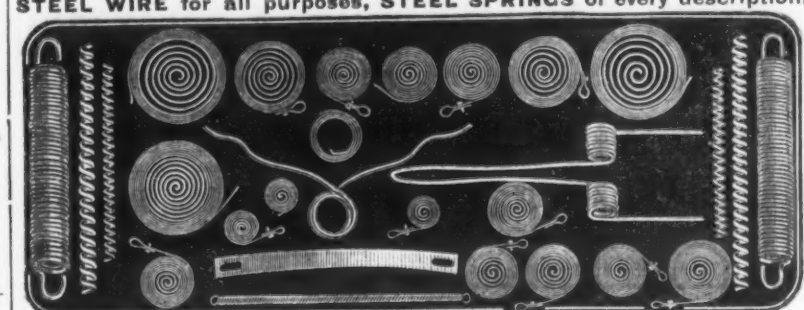
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The advantage claimed for this Vise over the
ordinary patterns is in the ease with which it is
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**Solid Box Vises, Hammers, Sledges,
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Our Vises are warranted to do more work than any other make. No broken boxes or screws.

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Market Steel Wire, Crinoline Wire, tempered and covered, also Patent Tempered
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This compound is put up and warranted genuine only in 1, 5, 10, 50 and 100 lb.
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General Agents at manufacturers' prices, in large or small quantities:

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H. R. IVES & CO., Montreal, Prov. of Quebec.

It is also for sale in 1, 5 and 10 lb. packages by Hardware Dealers generally through-
out the country.

O. LINDEMANN & CO.,
Manufacturers of

Bird Cages.
Received the
FIRST MEDAL
at the
World's Exposition of Vienna,
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Importers of GERMAN TEA TRAYS in
four colors. Catalogues and Price Lists
furnished to the Trade only.

RHODE ISLAND HORSE SHOE CO.,
Manufacturers of

**PERKINS and RHODE ISLAND PATTERNS of
HORSE AND MULE SHOES.**

Turbines at the Centennial.

(Concluded.)
GEYELIN'S DUPLEX "JONVAL" TURBINE.

To the Jonval wheel may be traced the origin
of that class, having as its distinguishing char-
acteristic a vertical discharge, and all turbines
which embody this feature of construction are
designated "Jonval" wheels, which term has
come to be regarded as a synonym of their ac-
tion. Among the many modifications may be
mentioned the Bodine Jonval, having as its pec-
uliar feature the register gate, a circular plate
placed over the top of the stationary chutes,
and having radial openings corresponding with
the latter. The before mentioned Lefel double
wheel embodies in its lower tier of buckets the
Jonval principle. A very serious defect in this,
as in other classes of wheels, has been the dis-
crepancy in percentage of power between full
and partial gates—the loss by the latter being
occasioned by the fact that, while the quantity
of water was reduced, the surface of the wheel
to be acted upon remained unchanged, and the
water by being allowed to spread lost seriously
in motive power. Recognizing the importance
of overcoming this objectionable feature, Mr.
Emile Geyelin, of Philadelphia, one of the most
prominent and successful hydraulic engineers in
this country, has devoted much attention to the
subject, and as the result has succeeded in con-
structing a wheel which has been found pre-
eminently capable of attaining the desired end,
as has been proven by a series of dynamometrical
tests at Williamsville, Connecticut, Nov. 30,
1875. Selecting the Jonval as the principle
which, under favorable circumstances of con-
struction, was, in his opinion, capable of
giving the greatest percentage of power, Mr.
Geyelin went at once to the root of the evil,
by constructing a wheel whose surface was ca-
pable of being reduced in proportion to the
volume of water, thus preventing any scattering
of the latter, and insuring the same ratio of
power with partial, as with full, gate. The
most advantageous variations from full to min-
imum power are placed at two-thirds and one-
third, although these proportions are not arbi-
trary, but may be modified as desired. A de-
scription of the wheel, although necessarily
brief, will convey a general idea of the pecu-
liarity of construction by which so important an
end is gained. The wheel proper, in the larger
sizes, is composed of two parts—the center,
containing the hub and arms, to which is se-
curely bolted the annular ring, containing two
sets of buckets composed of boiler plate, solid-
ly cast into the cylinders, forming the inner and
outer faces of the wheel, and a dividing ring
which separates and renders them independent
of each other. The buckets of the outer set
are placed opposite the center of the spaces of
the inner, thus equalizing the strain under full
gate, beside strengthening the wheel. The
guide casing is an annular ring open at top and
bottom, having a vertical section of an inverted
conical form, and being divided by a perpendic-
ular partition (corresponding in position with
the intermediate ring in the wheel) into an in-
ner and an outer space. In these two spaces
are placed the guides, which, like the buckets
of the wheel, are constructed of boiler plate,
and break joints as to their relative positions.
Both the guides and buckets contain the latest
improvements in regard to curvature, number,
&c., which have been found to give the best
results in establishing and receiving the cur-
rents of water. The central space of the guide
casing, with the exception of an opening for
the passage of the shaft, is entirely closed by a
slightly arched web, thus confining the passage
of the water to the chutes. Bolted to the in-
termediate partition of the guide casing is a ring,
or hood, having curved projections on each side
reaching a line perpendicular to the walls of the
inner and outer chutes, and at a height above
the latter necessary to give an area of cylindrical
opening equal to the annular area of the top of
the chutes. Surrounding the outer, and in-
closed by the inner, projection are two cylin-
ders, having each an independent vertical mo-
tion derived from suitable mechanism. These
form the gates, which, by being raised or low-
ered, open or close the cylindrical openings to
the chutes, thus supplying water to either or
both, as may be required. When it is necessary
to use the full power of the wheel both gates
are open; for two-thirds, the outer; and for
one-third, the inner; and in all cases, whichever
gate is used is wide open, thereby giving unimp-
eded admission to the water, and avoiding the
friction and broken currents invariably caused
by a partially closed gate. The combined area
of the inner set of buckets is somewhat more
than one-half that of the outer, the excess be-
ing for the purpose of making up for the de-
creased leverage incident to smaller diameter.
As the periphery of the wheel is a plain cylin-
der, and cannot cause friction, even when
running in the tail water, no casing is re-
quired below that of the chutes, except
where the draft tube is used. To over-
come the great pressure upon the step incident
to a downward discharge, a very excellent bear-
ing is used, having extremely large flat sur-
faces, between which water is forced under
pressure derived, where it is practicable, from
the head, and where this is insufficient, from a
force pump receiving motion from the wheel.
This, by interposing a thin film of water be-
tween the metallic surfaces, prevents actual
contact and consequent friction and wear, and
although a well known device, is novel in its
application to turbines, and is without doubt
the best anti-friction bearing known. As the
central portion of the wheel, contain-
ing the hub and arms, is above the level of the
tail water, and as the discharge from the buck-
ets takes place through ample ejection open-
ings, as soon as the power of the water is ex-
pended, all friction is reduced to a minimum.
The results of the above mentioned tests were
as follows: Diameter of turbine, 9 feet; fall of
water, 10 feet; speed in both tests, 40 revolu-
tions per minute; with 1100 square inches

(total opening in wheel, 130-20 horse power;
with 740 square inches (inner gate closed), 89
horse-power. This demonstrates conclusively
that with variable quantities of water this wheel
will develop power proportionate with the quan-
tity of water used. The large guide wheel ex-
hibited (10 feet 3 inches) is by K. D. Wood &
Co., of Philadelphia, who also show a Jonval
wheel of the original design. Although these
wheels are more particularly intended for the
larger sizes, where great power is required, the
firm have in course of construction one of suit-
able size for the coming test trials, to take
place under the auspices of the Judges of
awards beneath the eataract tank in the Hydraul-
ic Annex, where all wheels entered for competi-
tion will undergo the ordeal. The best skill
and appliances known to science will be em-
ployed to determine, beyond cavil, the relative
merits of the competing wheels, and to all ear-
ning for the subject of mechanics, the occasion
will be one of great interest. In ludicrous con-
trast with the immense wheel above mentioned
is one of the Jonval class, having a diameter of
1 inch, and capable of developing, with a three-
quarter inch stream, 200 feet fall, 1 horse-power.
This wheel is not a toy, but intended for prac-
tical use where small power is required. It is
the invention of Mr. James Haworth, of Phila-
delphia.

Steam Fire Engines.

It has been noticed by all who have seen
steam fire engines in operation that the
pressure of steam varies considerably in a
short space of time. Rising sometimes from,
say, 15 or 20 pounds below the blowing off of the
safety valve to as much above, and then, on
opening the fire door, falling to the origi-
nal point. Now this, in itself, is injurious
to the boiler, and could be prevented by proper
attention, allowing the fireman to have a steam
gauge in a conspicuous place in addition to the
engineer's gauge. The engineer would then be
a check upon him. There should also be a dam-
per in the stack to regulate the draft, as in sta-
tionary and marine boilers. This damper
should be placed below the exhaust for ap-
parent reasons.

The feed is placed near the bottom ring of
the boiler, just high enough to give a clear flow
in case of mud collecting between the shells.
The space between the fire-box and outer sheet
is generally about 1 1/2 inches only. Cold water
is fed into this space on one side, while on the
other the temperature is sufficient to melt iron.
The disadvantages of such an arrangement are
apparent, as it causes crystallization of the
boiler plates, and hence, liability to blow out at
the injured points, beside the lessening of
water in the boiler, which, of course, brings
down the steam. The proper remedy for this
would be a heater, very few, if any, of which
are used on steam fire engines. This heats the
feed water to a temperature a little below that
of exhaust steam.

The fuel box in front of the fire door might
be discarded to make access to the boiler more
easy, and in its place have a tender drawn by
one horse. This arrangement would be better
than the present, not only as taking off of the
weight and size of the engine, but in allowing
more capacity for fuel. When a fire is of long
duration, it often happens that the fuel is ex-
hausted, the engines having to run constantly,
and it becomes necessary to stop till more coal
or wood can be obtained.

Hard coal might be used in this manner:
Fire knots (many engines use knots exclusive-
ly) to get up steam, and then use the authen-
tic coal. It would take less space and weight
than soft coal or wood, beside the least cost for
making the same amount of steam as other
kinds of fuel.

Engineers and firemen should be compelled
to be licensed, as on railroads, steamboats, and
in the marine service, as their knowledge and
skill would then enable them to guard against
everything injurious to boilers and engines,
and make a saving in repairs and fuel, as well
as diminish danger from explosion.

The Hell Gate Blast.—The great blast
which was to have taken place on the 4th of
July at Hell Gate, has been postponed until
September. The excavation is completed, but
the contracts for explosive materials have not
yet been filled. The battery for exploding the
charges will be placed near the edge of the pit;
the operating roots will be about 350 feet from
it. The explosive materials used will be nitro-
glycerine and its various compounds, in charges
not exceeding ten pounds each, and placed at
points where they will be most effective. Gen.
Newton says that the water not only will act as
a tamping or covering, preventing by its weight
an intense report and shock, but that the enor-
mous amount of heat generated from the lib-
erated gases will spend its force in vaporizing
the water, thus lessening the chances of marked
agitation on the surface. It is not expected
that much if any rock will be thrown above the
water, except where the bed-rock may have
weak spots or seams. In such cases the ex-
plosion will have more effect and throw the
rock some distance in the air. The object of
dispersing the nitro-glycerine is to effect a
rending of the rock, so that it can be more
effectually broken up by after blasts. The
works cover three acres, and the amount of
debris which will have to be removed is esti-
mated to be not less than 30,000 cubic yards,
requiring about two years' further work. Gen.
Newton expresses as his opinion that the sci-
entific delegations which have applied for the
privilege of making determinations in refer-
ence to the rapidly with which sound travels in
earth, air, and water, will be disappointed in the
results of very many of their calculations,
especially those which propose taking stations
at some distance from the work. He anticipates
no remarkable report or violent concussion,
owing to the distribution of the nitro-glycerine
through so large an area and in such small
quantities. The effect of the blast, to use the
General's own words, will sound very much
like "an explosion in a tub of muck." The
only work being done at the present time is
pumping the water out as fast as it drains into
the tunnels.

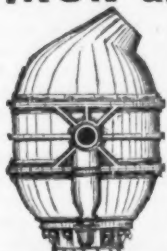
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Situated on the line of the Pennsylvania Rail Road,
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Their location, coupled with every known im-
provement in machinery and process of manufacture
enable them to offer Rails, when quality is con-
sidered, at lowest market rates.

The long experience of the present Managers,
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are deemed a sufficient guarantee that purchasers can,
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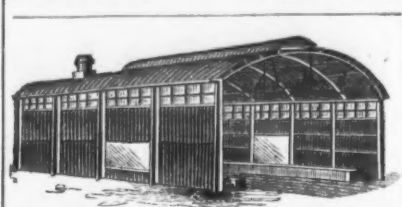
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FOR SALE,

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METAL DEALERS

In the Large cities throughout

THE UNITED STATES.

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Notice to Manufacturers of Fruit Can Trimmings.

The superior quality and cheapness of the produc-
tion of my **PATENT FRUIT CAN TRIMMINGS** (Patented April 6, 1875), having induced
certain parties to infringe my patent, I have com-
pelled them to cease manufacturing, and I will pro-
ceed against any one who may infringe in the future.

The Very Best

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(3 1-2 Inch Opening.)

Are manufactured under process patented April 6,
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WOODBURY STAMPING WORKS,

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I am making arrangements to the end that at least
one prominent house in all the principal cities of the
United States will keep a supply of my trimmings,
for the trade.

J. M. PATTERSON,

Sole Manufacturer,

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Samples furnished free upon application ac-
companied by business card.

Mining and Metallurgy at the Interna- tional Exhibition.

NO. V.

Following the brief sketches of the mineral
wealth of the far-off British colonies, we come
to the most important and to us the most inter-
esting possessions of the mother country, those
forming a part of our own Continent.

To say that the British possessions in North
America are well represented feebly expresses
the admirably arranged collection of economic
minerals and geological specimens which illus-
trate the work of the Canadian Geological Sur-
vey. The natural resources of the various
provinces are displayed in a collective exhibit,
which demonstrates that although the colonies
do not share in the satisfaction of 100 years of
independence, and that in an area equal to that
of the United States they have but one-tenth
of the number of inhabitants; yet in the dis-
tribution of metallic ores, fuels and earthy ma-
terials from which industrial products can be
extracted they have not been overlooked. The
exhibit occupies the rear of the Canadian
court, along the north wall of the Main Exhi-
bition Building, and is systematically arranged
under the following heads:

1. Metals and their ores.
2. Materials used in the production of light and heat.
3. Minerals applied to certain chemical manu-
factures and their products.
4. Mineral manures.
5. Mineral pigments and detergents.
6. Salt, brines and mineral waters.
7. Materials applicable to common and deco-
rative construction.
8. Refractory materials, pottery clays and
pottery.
9. Materials for grinding and polishing.
10. Minerals applicable to the fine arts and to
jewelry.
11. Miscellaneous minerals.

It is not our purpose to refer to all of these
classes, but only to give a brief resume of such
of them as will be of interest to our readers.
Those who are desirous of examining more
fully into the natural resources of British North
America, will soon be able to have valuable as-
sistance from a very complete catalogue now
in preparation by Prof. Selwyn, the able di-
rector of the Geological Survey of Canada.
This catalogue will describe the location and
character of the deposits of the various min-
erals, give analysis of their composition, state-
ments as to development of workings, and in-
dicate their geological position. Some of the
specimens already have this information at-
tached to them, cut from proof sheets of such
parts of the catalogue as have gone to press,
and they are very thorough and complete ex-
positions. The Geological Survey have dis-
played some instructive charts and maps and a
very good collection of rocks. We were particu-
larly impressed with a geological map of
Nova Scotia, and also a map, the finest and
largest we have ever seen, illustrating the ge-
ology of North America above the now happily
forgotten boundary, formerly known as Mason
and Dixon's line. (The original notes of the
survey of this line are on exhibition also.)

The coals of British Columbia are displayed
at the western end of the collective exhibit,
while at the eastern extremity blocks and col-
umns of coal representing the various seams
in Nova Scotia, Cape Breton and New Brun-
swick, from 2 to 13 feet in thickness, stand as
sentinels guarding the display. Among the
coals from British Columbia are some very good
bituminous specimens which coke well, but
the most interesting is a lump of superior an-
thracite which, as analysis shows, contains 86
per cent. of fixed carbon, 2 per cent. of water,
7 per cent. of ash, 1 per cent. of sulphur and 4
per cent. of volatile combustible matter. This
anthracite is found in the Queen Charlotte
Islands, on the western coast of British Col-
umbia, and large expenditures to develop it
have met with but meager success, the vein
thinning out or changing to an inferior coal.
In one instance this coal was found in a vein 6
feet thick.

New Brunswick displays a block of ordinary
bituminous coal, and specimens of Albertite
and its accompanying shales. This deposit is
peculiar to Albert county, N. B., and has been
used to a considerable extent in the United
States for the manufacture of illuminating
gases, one ton of Albertite yielding 14,500 cubic
feet of illuminating gas or 100 gallons of crude
oil; 9000 cubic feet of gas from a ton indicates
a superior gas coal.

The Albertite has really no definite place in
mineralogy, being a sort of cross between a
true coal, an asphalt and jet, various sci-
entists having ascribed it to each of these. In ap-
pearance it strongly resembles asphalt. The
accompanying shales are also used for generat-
ing gas and producing oil, 60 gallons of oil or
7500 cubic feet of gas having been extracted
from one ton of the shale; but some of the
shale is much inferior in product.

Nova Scotia coals are illustrated by samples
of the Pictou and Cumberland veins, containing
from 55 to 66 per cent. of fixed carbons, and
the Island of Cape Breton has quite a number of
sections of veins, some of them over 8 feet
thick, on exhibition.

From the northwest territory there is con-
tributed a block of lignite a foot square and 4
feet high. It is, more properly, a coal contain-
ing considerable water. Its analysis is:

Water	10.90
Volatile combustible matter	38.69
Fixed carbon	54.96
Ash	5.45

Crude petroleum and its various products
represent the Enniskillen oil region in Ontario,
which produces about 100,000 barrels per an-
num. Specimens of crude petroleum and
sandstone impregnated with petroleum, from
the Athabaska River, show one of the products
of the Northwest territory.

Specimens of peat from the Province of Que-
bec, prepared by Hodge's and by Griffin's pro-
cesses, are exhibited with the statements that
it sells for \$3.50 per ton at the works, and that
the Grand Trunk Railway consumes in their lo-
comotives about 20,000 tons per year.

The display of iron ores and their products is
very complete, over 50 localities being repre-
sented by a great variety of specimens of mag-
netites, hematites, ilmenites, limonites (includ-
ing bog ores), specular and spathic iron and
clay iron stones. There is also a fine meteorite,
weighing over 350 pounds, from the Province of
Ontario, which has, combined with the native
iron, 6½ per cent. of nickel.

The peculiar Moisie iron sand found in the
Province of Quebec, and some of the iron made
from it, are on exhibition. The product from
this iron sand was a question of considerable
diplomatic correspondence, bearing upon the
duty to which it was subject at our ports of
entry. As the iron sand is reduced in a bloom-
ery, the claim was made that the billets should
enter as pig iron and not as refined iron.

Very superior magnetites are shown from
some of the islands on the Pacific coast. One
sample of 68 per cent. ore contains but 3-1000ths
of 1 per cent. of phosphorus. Another specimen
yields 71½ per cent. Two magnetites from On-
tario yield respectively 60 and 53 per cent. of
metallic iron, and a third analysis 65 per
cent., but is inconveniently located for ship-
ment.

Hematites of unusual richness from Thunder
Bay, Lake Superior and from the provin-
ces of Ontario, Quebec, New Brunswick
and Nova Scotia—one from the latter yield-
ing over 68 per cent. of metallic iron,
and containing very little sulphur and no
phosphorus—are exhibited with pig iron and
bars. A titaniferous ore from Bay St. Paul,
Quebec, is shown, which, though occurring in
large quantity and yielding about 40 per cent.
of metallic iron, has not been worked econo-
mically on account of the amount of fuel required
to smelt it. The limonites embrace compact,
ochrey and fibrous limonites from Nova Scotia,
and bog iron ores from Ontario, Quebec and
New Brunswick. Some of them are exhibited
in connection with the pig and wrought iron,
slags, etc., resulting from the melting and re-
fining of the ores. This is especially the case
with the Steel Company of Canada, whose dis-
play embraces limonite ore, charcoal pig iron,
chilled cast wheels and rolls, cast iron chains,
light castings and steel of various qualities, all
of which are products from the ores displayed.
An interesting feature is the peculiar flux
"Ankerite," a magnesian calcite, employed in
reducing the ore at the company's furnaces.

Native copper from the Fraser River in
British Columbia, and from the Michipicoten
Island in Lake Superior, and sulphides of cop-
per from the various colonies, together with
ingots, demonstrate the presence of this
metal in Canada. Among the specimens is a
portion of a large boulder of copper glance,
which analyzed 62 per cent. of metallic copper.
A large proportion of the copper ores mined in
Canada are carried to England for reduction,
although works have been constructed in the
colonies for smelting and for reduction by
both the Hunt and Douglas and the Henderson
processes.

Zinc is found in the Lake Superior region in
the form of sulphide or blende, but not gener-
ally in promising quantity. It is usually asso-
ciated with iron and copper pyrites and galena.
In fact, galena and blende are found together
throughout this Lake Superior region—the prin-
cipal lead deposit of the colonies. Some of the
specimens are obtained from the shores of, and
islands in, Silver Lake, located six miles north
of Thunder Bay and 500 feet above Lake Su-
perior. One Lake Superior specimen analyses
47½ per cent. of lead, and 10 per cent. of copper,
with about 18 pennyweights of gold, and over
two ounces of silver per ton. This ore is in a
solid vein 4 feet wide at the surface.

Galena in calcite, pig lead from Ontario, and
galena with pyrites from the Cariboo Mountains
in British Columbia are also exhibited. Fine
grains of native platinum, which occur with al-
luvial gold in some of the British Columbian
streams, are displayed, and are of marked in-
terest.

Specimens of sulphide of bismuth and metal-
lic bismuth made from the sulphide, which oc-
cur near Tudor, Ontario, and antimony ores
from Quebec and Ontario are exhibited. The
ores from Quebec include both stibnite and
kermesite; those from Quebec consist of gray
sulphide (stibnite) raw and roasted, displayed
by the Lake George Mining Company in con-
nection with antimony, regulus and Babbitt
metal.

Nuggets of native silver, silver ores and sil-
ver ingots from British Columbia, and native
silver, silver glance, and argentiferous galena,
from various localities in the Lake Superior re-
gion, form an attractive portion of the display.
Some of the ores and native silvers are remark-
ably beautiful specimens; particularly is this
the case with those exhumed from Silver Lake,
a mere rock in Lake Superior, the exposed sur-
face of which was too small and the elevation
above the water too slight to carry on the min-
ing operations properly until crib work was
constructed. At present the workings are 550
feet below the lake, and branch out from the
shaft. One specimen containing \$700 worth of
ore is polished to show the dissemination of the
metal throughout the mass. The product from
this lake is estimated to have reached at the
present time two and a half million dollars.
A series of specimens "brown ore" occurring
with galena and blende in bitter spar, on the
north shore of Lake Superior, are quite attrac-
tive.

A score of localities in British Columbia are
represented by gold specimens, and a gilded
pyramid illustrates the production of this pro-
vince, which has amounted in value since 1858 to
more than \$38,000,000. The annual output has

varied from one million to nearly four millions,
and an octahedron representing the average
surmounts the pyramid. This metal seems well
distributed throughout British Columbia, but
the Cariboo, Omineca and Cassiar are the prom-
inent gold fields; the latter is the most north-
ern, and gives promise of being the most pro-
ductive.

There are also in the collection gold bearing
quartz and alluvial gold, from the northwest
territory and from the Lake Superior region;
and gold bearing arsenical pyrites, gold and
silver bars, paris green, white arsenic, and
brown pigment residuum, resulting from the
separation of this ore which occurs in the Mar-
mora district of Ontario.

Models and samples of superior nuggets from
the basin of the Chaudiere in the Province of
Quebec attest to the presence of the precious
metal in considerable quantity. No thorough
working of this district has been made, al-
though it is claimed that gold can be found on
most of the streams, and that in one case a far-
mer took out with a pan in one day \$1200. The
old French Canadians, unwilling to lose posses-
sion of their lands, have discouraged all mining
innovations.

The auriferous quartz which occurs along the
Atlantic coast of Nova Scotia is illustrated by
specimens. Since 1852 this Province has pro-
duced about \$4,500,000 of gold. In a modest
case there was exhibited a tray containing two
gold bars, a number of nuggets and gold dust,
aggregating in value over \$13,000. Owing
we suppose to the watchfulness it required this
exhibit has been removed, we hope only tem-
porarily, for it is a relief after inspecting gilded
models to feast one's eyes on the pure metal.
A knowledge of the presence of such a display
would bring many to view so unusual a sight.

A feature in the collective exhibit is the dis-
play of the Dominion of Canada Plumbago
Company. In one case is a mass of remarkably
pure plumbago, weighing 4870 pounds, and in
another case are specimens of the mineral and
its product—crucibles, lubricants, pencils,
stove polish, etc. The graphite from the mines
of this company at Buckingham, Quebec, is
claimed to contain 96 per cent. of carbon.
Specimens from other localities in the provin-
ces of Ontario and Quebec are also shown.
An interesting display is made of iron py-
rites, with salt cake, nitrate of soda, nitric
sulphuric and hydrochloric acids, and other
products.

The collection of building stones is quite
large and varied, consisting of sandstones,
marbles, limestones, and some very beautiful
dolomites; monuments and blocks cut from the
various stones demonstrate the quality. One
contributed by the Dorchester Freestone Com-
pany, of New Brunswick, is a representation of
our cracked liberty bell, with its legend, "Pro-
claim liberty," etc. Superior gypsums, sand-
stones and sand for furnace linings and glass
making, flagstones, grindstones and litho-
graphic stones are on exhibition. Specimens
of work done on the lithographic stones
attest to their commercial value. The dis-
play of slate is exceptionally fine. Spec-
imens prepared for various purposes demon-
strate its usefulness, while its strength
is illustrated by a slab seven inches wide and
three-eighths of an inch thick, resting upon
supports 30 inches apart, and sustaining a block
of stone in the center weighing 172 pounds.

The examination of the collective exhibit of
the North American possessions of Great
Britain has been to us a source of much pleasure
and profit, for by it we learned much about our
neighbors and the resources of the country.
To those of our readers who would study the
physical features of Northwestern America we
would recommend a careful examination of
Mr. Anderson's large map in the collective
mineral exhibit, in connection with his descrip-
tive pamphlet, freely given to any who are in-
terested.

Refrigerators in Detroit.—The Detroit
Free Press has the following account of an in-
teresting incident in that city:

A Nankin farmer visited a Detroit hardware
store yesterday, and when he mentioned the
fact that he would like a refrigerator, the
proprietor welcomed him with a sunny smile,
and the clerks cheerfully barked their shins
against the stove as they flew around.

"Will you look at these ice chests?" asked
the proprietor, as they came to a long row.

"What do you want to keep ice in a chest,
for?" growled the farmer. "What I want is
something to keep provisions cool and nice in
hot weather."

"Well, here you have it. Here is the best
refrigerator made."

The farmer opened the door, looked the box
over and around, and seemed much pleased
with it. Presently he inquired:

"What is the principle of the thing—how
does she cool off the provisions?"

"You put your ice right in here, shut the
box and away she goes," was the reply.

"Ice!" gasped the farmer.

"Why, of course. You can't run a refrig-
erator without ice, can you?"

The farmer turned without a word, walked
down stairs and out to his wagon, and was get-
ting in, when the hardware man hurried up and
asked:

"What's the matter?"

"Do you think I'm a four-cornered fool?"

howled the agriculturist. "Do you think I'm
going to buy that high-priced provision asylum
and then keep ice too?"

Electric Lighting.—The Great Northern
Railway of France has been making a series of
experiments on the use of the electric light.
Under the direction of M. Fresca, the luggage
department of the Paris Station has been illu-
minated by a 3 horse-power Gramme machine.
M. Fresca states, in his report presented to
the Academy of Sciences, that the electric
light is a hundred times less expensive than oil,
and 50 times cheaper than gas.

Iron.

CLEVELAND.

Cleveland, Brown & Co.

IMPORTERS, MANUFACTURERS AND DEALERS IN

IRON AND STEEL,

HORSE SHOES, HORSE NAILS,

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J. BLODGET BRITTON.This Laboratory was established in 1866, at the instance
of a number of practical Iron-masters, expressly to afford
prompt and reliable information upon the chemical com-
position of the substances above mentioned, for smelting
and refining purposes. The object being to make it as
convenient, practically useful, and comparatively
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termine, the charge must necessarily depend
upon circumstances.
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rence..... 6 00
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soluble Silicious Matter in a Limestone..... 10 00
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Coke, or of an Ash of Coal the charges will correspond
with those for the constituents of an ore.
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Printed instructions for obtaining proper average sam-
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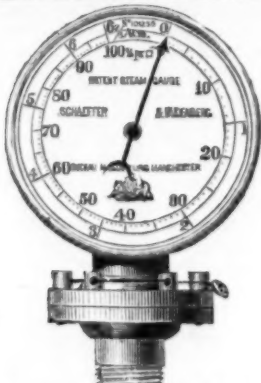
Special attention given to analysis of Iron and Steel.

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Screw Eyes, Hooks, &c., also many sizes of their
Screws, which can be supplied very advantageously
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cases, at greatly reduced prices. Apply for terms at
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Steam, Boil, Vacuum and Hydraulic Gauges, Engine
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Flat Bars up to 6x2. Rounds and Squares up to 4 inch, Ovals, Half
Ovals, Half Rounds, Box Iron Cylinder Bars, Plow Beam Iron, &c. Also,
Hoop, Band, Horse Shoe and Shafting Iron of superior quality. A full assort-
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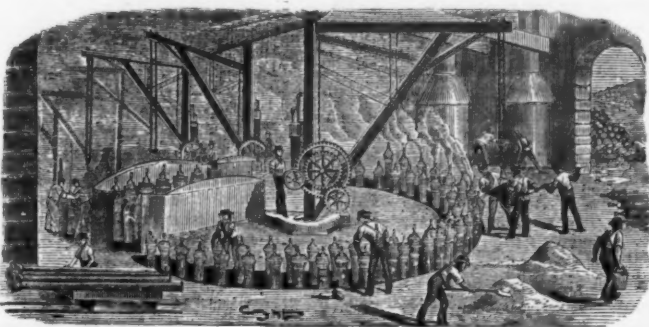
All patterns kept in store or made to order. Link and Pin Iron in stock.

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Iron. Wrought Iron Girder, Channel & Deck Beams.ANGLE and T IRON, BOILER and TANK RIVETS, Lap-Welded Iron Boiler
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Iron Fronts, Stair Girders, Lintels, Columns, etc

The American Ice Chisel

THE HARDWARE TRADE are hereby cautioned against an imitation of our American Ice
Chisel, made of Malleable Iron Castings, which has made its appearance in the market. It is nickel
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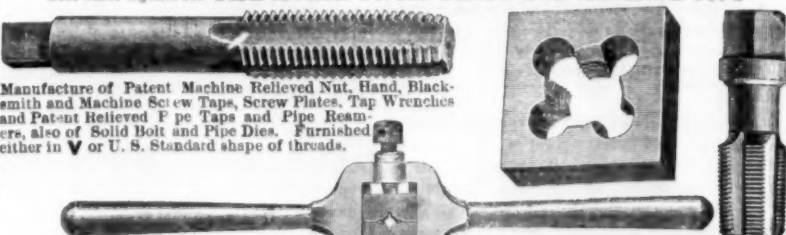
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Having introduced New and Improved Machinery into their Rolling Mills, and manufacturing all their
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SWIFT MILL.

ESTABLISHED 1845.

The annexed cut shows one of the many
styles of Coffee Mills of our manufacture,
especially adapted to Grocers' use and all retailers
of coffee. They are highly ornamental, and
workmanship of the very best. Silver Medal
awarded at the Great Fair of American Institute
last autumn. We make more than 30 styles.

ALSO

Lane's Portable Coffee Roaster

Will roast 30 to 40 lbs. at once, and can be used
as a stove at other times.
Send for descriptive list.

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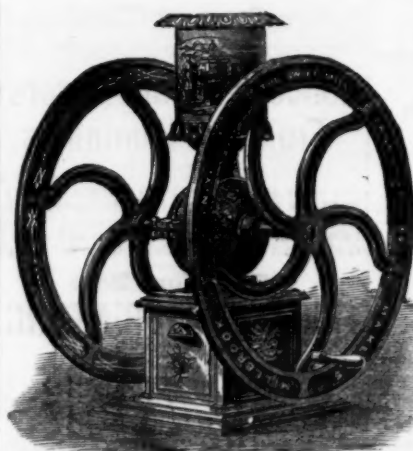
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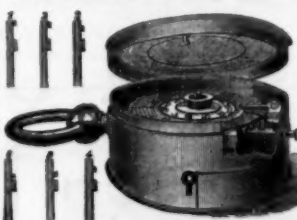
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Watchman's Time
DETECTOR.Important for all Large Corporations and
Manufacturing Concerns.Capable of controlling with the utmost accuracy the motion of a watchman or patrolman as the same
reaches different stations of his beat. The instrument is complete in itself, portable and as reliable as the
best lever watch. It requires no fixture or wires communicating from room to room, as is the case with the
ordinary watch clocks. A small inexpensive stationary key is alone required at each station. The instrument
will, in all cases, be warranted perfect and satisfactory.CAUTION.—The public are notified that in my suit against Imbueser & Co., of New York, a decree
was made in my favor, June 10, 1874.Proceedings have been commenced against said Imbueser & Co., for selling clocks contrary to the
order of the Court, and especially the clock with a series of springs in the cover, and marked "Patented
Oct. 20th, 1874." All persons discovered using these infringing clocks will be dealt with according to law.

J. E. BUERK, Proprietor,

P. O. Box 979. No. 230 Washington Street, Boston.

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**PUMPS,
HYDRAULIC RAMS,
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AND OTHER

Hydraulic MachinesIN THE
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Awarded the GRAND MEDAL of PROGRESS at WORLDS' EXPOSITION, VIENNA, 1873, being the highest awards on Pumps, &c., also, highest medal at PARIS in 1867.

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UNION MANUFACTURING COMPANY,

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LOOSE PIN REVERSIBLE,

Cast Fast & Loose,

Drilled and Wire Jointed.

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IRON & BRASS PUMPS,Garden, Well, and Force Pumps, Yard, Drive Well, Garden Engine and Steam Boiler Pumps, Hydraulic Rams, etc., and all with the most modern improvements. *See Fine Catalogue a Specialty.*

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Bellows Factory and
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51 Beekman Street, N. Y.**NEWCOMB BROS.,**
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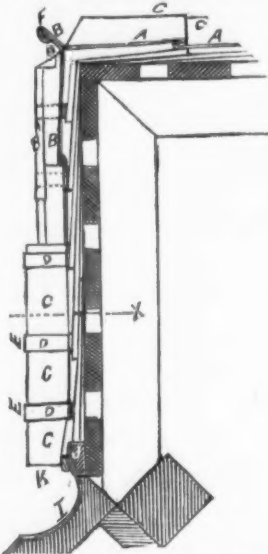
C. W. VAYO & CO.,
Manufacturers of
WHIPS & LASHES
OF EVERY DESCRIPTION.
Office & Salesrooms,
Cor. PINE & MILL STS.,
LOCKPORT, N. Y.

**New Patents.**

We take the following abstract of new patents, recently issued, from the official record:

METALLIC ROOF.

To F. C. Conklin, Monroe, N. Y.—June 6.—1. The combination, with a shingle roof, of strips A, extending from peak to eaves, having top flanges B, turned at F, and provided with side flanges C, the strips D, nailed at the butt

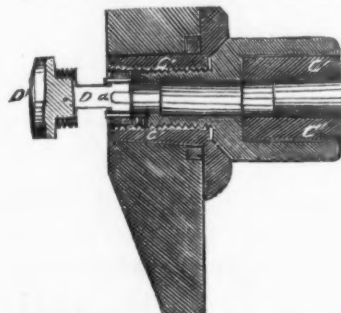


of each row of shingles and hooked over flange at E, and the wood strip G, arranged along the margin and edge of strips A, all constructed and arranged to form a secure covering for an old shingle roof.

2. The wood strip J, arranged along the eaves of roof, and connecting the trough I with strips A by the seam K.

FAUCET ATTACHMENT.

To Harry E. Sadler, Brooklyn, N. Y.—June 6.—1. The wooden plug D, attached to the end of adjustable tube D, and preventing contact of liquid with the metal of faucet attachment.



2. A detachable faucet key, having a threaded tubular part for screwing into bushing, and an outer socket part with wood lining, for retaining the faucet.

WELL.

To Samuel W. Belles, Orion, Mich.—June 6.—By the construction no water can enter the well except at the bottom. The well described, consisting of the pipe B, having a perforated lower end, the cobble stones C, and the cement covering.

**HEATING STOVE.**

To John J. Gill, Mexico, Mo.—June 6.—1. The combination, in a stove, of the fire chamber B, vent G, flues E and I', opening i, damper e, and flue J.

2. The combination, in a stove, of the chamber B, vent G, opening i, and flues I' and J.

3. The combination, in a stove, of the chamber B, flue E, flue I, and vent G.

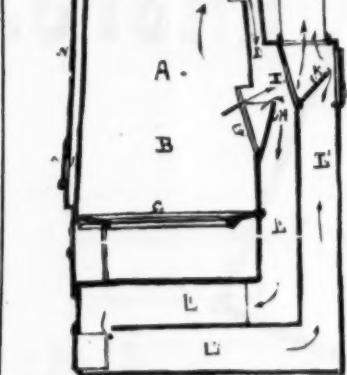
4. The combination, in a stove, of the chamber B, flue E, damper e, flues I', vent G, opening i, and flue J.

5. The combination, in a stove, of the chamber B, vent G, opening i, flues I' and J, and door M.

6. The combination, in a stove, of the chamber B, flue N, exit E, and flue I.

7. The combination, in a stove, of the chamber B, flue N, openings n and n', plate O, flange P, exit E, and flue I.

8. The combination, in a stove, of the chamber B, vent G, flue N, exit E, and flue I.



9. The combination, in a stove, of the chamber B, flue N, and flue E.

10. The combination, in a stove, of the chamber B, vent G, guard H, flues L, L', &c., and flue J.

11. The combination, in a stove, of the chamber B, vent G, flue I', opening i, flue J, and flues L, L', &c.

12. The combination, in a stove, of the chamber B, exit E, flues I' and L, L', &c., and J.

13. The combination, in a stove, of the chamber B, flue N, exit E, flues I', vent G, and flues L, L', &c., and J.

14. The combination, in a stove, of the chamber B, vent G, guard H, exit E, flue I and flue I'.

15. The combination, in a stove, of the chamber B, vent G, guard H, exit E, flue I, flue I', damper K, opening i, flue J, damper e and door M.

16. The combination, in a stove, of the chamber B, vent G, guard H, exit E, flue I, flue I', damper K, opening i, flue J, damper e, door M, opening F, grate C and ash-pit D.

17. The combination, in a stove, of the chamber B, vent G, guard H, exit E, flues I, I' and J, damper K, opening i, damper e, door M, opening F, grate C, pit D, and flues L, L', &c.

18. The combination, in a stove, of the chamber B, vent G, guard H, exit E, flues I, I', J and N, damper K, opening i, damper e, door M, opening F, grate C and ash-pit D.

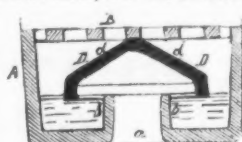
19. The combination, in a stove, of the chamber B, vent G, guard H, exit E, flues I, I', J and N, damper K, opening i, damper e, door M, opening F, grate C, ash-pit D and flues L, L', &c.

20. The combination, in a stove, of the chamber B, vent G, guard H, exit E, flues I, I', J and N, damper K, openings i F n n', damper e, door M, plate O, flange P, grate C and pit D.

21. The combination, in a stove, of the chamber B, vent G, guard H, exit E, flues I, I', J, N and L, L', &c., damper K, openings i F n n', damper e, door M, plate O, flange P, grate C and pit D.

STENCH TRAP.

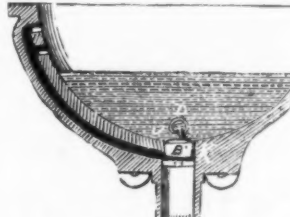
To Peter Summers, Philadelphia, Pa.—June 6.—The combination of the casing A, having plain vertical sides, and the horizontal grating



B, with the inverted cup D, having steeply inclined sides d and ends e, which unite at the top in a narrow strip, secured to the central longitudinal bar of said grating.

WASTEWAY STOPPER—REISSUED.

To Joshua R. Gibson and James Powell, Cincinnati, Ohio.—Patent No. 117,402, dated July 25,



1871.—June 6.—1. A wasteway plug having its bearing sides constructed wholly of rubber, or equivalent yielding material.

2. The elastic packing F, mole G, washers H I and stem J.

WASTEWAY STOPPER—REISSUED.

To Joshua R. Gibson and James Powell, Cincinnati, Ohio.—Patent No. 117,402, dated July 25,

1871.—June 6.—A wasteway plug having its bearing sides constructed wholly of rubber or equivalent yielding material, in combination with a metallic seat or socket.

SHEET METAL CAN.

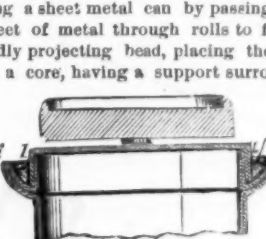
To Alfred A. Chevallier-Appert, Paris, France.—June 13.—Inwardly and outwardly bending heads, vent, guard and soft metal tube on one head. Uses a mandrel having a concave face and central opening—first,

to support body while bottom is being soldered to it; next, to support top while the soft metal tube, supported by an awl, is soldered to the top; and, third, to support the same while the guard is soldered to the under side of the top.

A metallic can provided with convex depressible ends, in one of which is a soft metal tube and a valve.

SHEET METAL CAN.

To J. F. Merrill, Cincinnati, Ohio.—June 13.—1. The process herein described for constructing a sheet metal can by passing a suitable sheet of metal through rolls to form an outwardly projecting head, placing the sheet



around a core, having a support surrounding the sheet with a clamp, having a counter bore, and striking the upper surface of the head.

2. As a new article of manufacture, and an improvement in the construction of sheet metal cans, the trough I, exterior to the body, and whose outer wall is constituted of two thicknesses, formed by compression of an outer bulge from the body, and has a rim or margin i, having a rounded surface of tinned iron, formed by the bend of said thicknesses.

178,272.—Sheet Metal Can.—George H. Chinnock, Brooklyn, N. Y.—June 6.

Solders upper edge of the soft metal strip to lid, and bends its lower edge inward against, and above or below, bead on can. Places glue or gelatine in the chamber so formed. May solder strip to cover, insert the cement, and close by bending, or first attach strip to can by

bending, insert cement, and solder strip to cover.

PLUMBERS' TRAP.

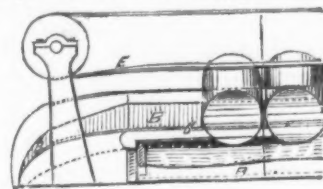
To Frederick Adee and James Foley, Brooklyn, N. Y.—June 13.—The plumbers' trap made of



two parts, one of which is cup-shaped and cast with a dam in it, and the other is cast with a tubular extension, and the two parts are united by a horizontal, or nearly horizontal, joint.

SOLDERING MACHINE.

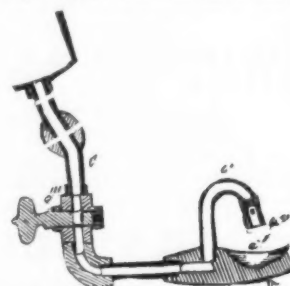
To W. H. J. Howe, North Salem, N. Y.—June 13.—The band, by friction, rolls the cans along the trough, their seams meanwhile projecting through slot in bottom of trough, and into the



solder bath, and onto the incline. Bottom fold of band may be beneath cans, and top fold then propels cans. The combination, is a soldering machine, of the flanged, slotted, and inclined track B, endless band E, and solder trough D.

SOLDERING MACHINE.

To I. Hayes, Philadelphia, Pa.—June 13.—The soldering implement, consisting of the solder-



ing iron proper A, provided with the concavity a', in combination with the gooseneck c', provided with the adjustable thimble c'', the rigid tube C, adjustable cock c'', handle 5, reservoir B.

APPARATUS FOR TINNING OR COATING METALS.

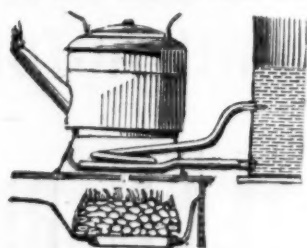
To E. Morewood, Llanelli, and J. H. Rogers, Llangennech Park, near Llanelli, England.—June 13.—The flux box above the coating rollers is provided with pairs of rollers, to regulate the motion of the sheet of metal to be coated.



The flux box A above the pair of coating rollers B, and made with a narrow mouth, so as to protect the flux from the heat of the melted coating metal, in combination with one or more pairs of rollers within said flux, for moving the plates to be coated at the required speed.

WATER HEATER FOR STOVES.

To John A. Frey, Washington, D. C.—June 13.—A water heater contained within a casing,



which casing is open at its upper and lower sides, may be placed over the boiler hole of a stove, and its upper side is adapted to receive and contain a cooking utensil.

178,225.—Pump.—John S. Adams, Elgin, Ill.—June 6.

Water passes around the lower valve and returns to the well, for the purpose of emptying the pump to prevent freezing, and for washing out the sand trap, when the pump is provided with such a device.

178,253.—Automatic Air Valve for Water Pipes.—John A. Stacy and John W. Carroll, Cincinnati, Ohio.—June 6.

The valve is attached to a water service pipe, to admit air to drain it when water is cut off and the waste open.

178,262.—Gas Burner.—Wm. F. Bonnell, Jr., Boston, Mass.—June 6.

Two receptacles for packing, with expansion chamber between.

178,310.—Hose Coupling.—Edwin A. Leland, New York.—June 6.

178,313.—Pipe Coupling.—Edwin A. Leland, New York.—June 6.

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Pawtucket, R. I.

The American File Company have the exclusive right to use the Bernot process for cutting files. By this method all the advantages of hand cutting are secured, together with an accuracy unattainable in hand work. They are the only manufacturers who employ machinery for testing files and steel.

Goods of all known manufacturers have been repeatedly tested, and interesting tables have been compiled showing the working qualities of files made by different makers, and of files made from different steels, and with various shapes and angles of tooth. They have thus revealed the manufacture of files to an exactness and perfection with a uniformity of result, as they believe, never before attained. No file, foreign or domestic, that they have ever tested, has equalled the performances of their own goods taken at random from their stock. Their machines are capable of the most delicate adjustment, and can produce the very finest work known to the trade. Special files made to order. Prominent file manufacturers are having their best goods from our works. Price lists and information furnished on application.

AMERICAN FILE CO., Pawtucket, R. I.

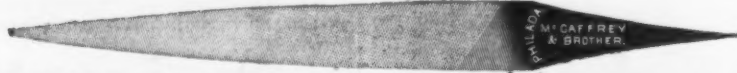
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McCaffrey's Standard American Hand Cut Files and Rasps are warranted to do more work than any other files and rasps in the market.

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TRADE MARK

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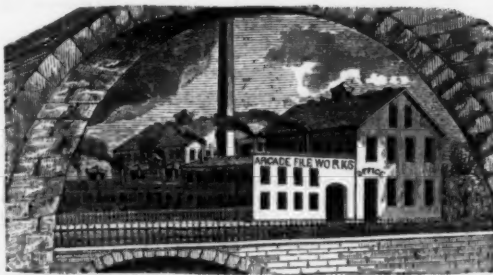


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FILES AND RASPS
Made from Best
ENGLISH CAST STEEL.
Quality guaranteed by written warranty
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FILES AND RASPS,

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MANUFACTURERS OF EVERY DESCRIPTION

—OF—

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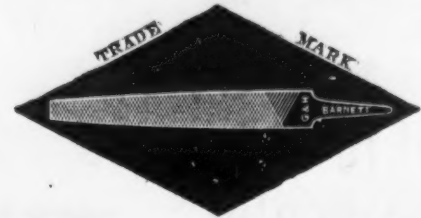
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Black Diamond File Works.

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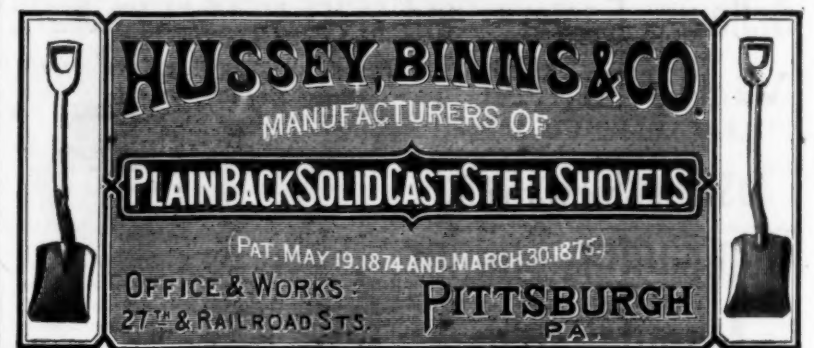
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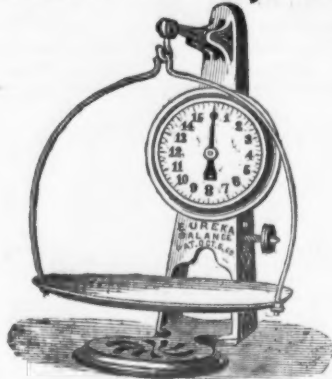
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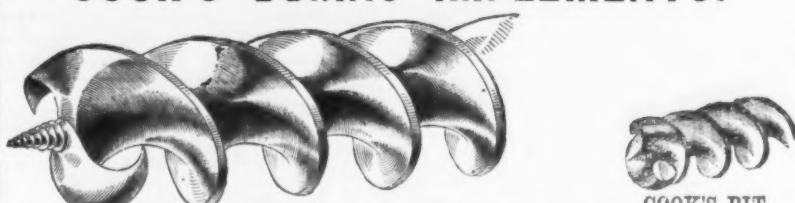
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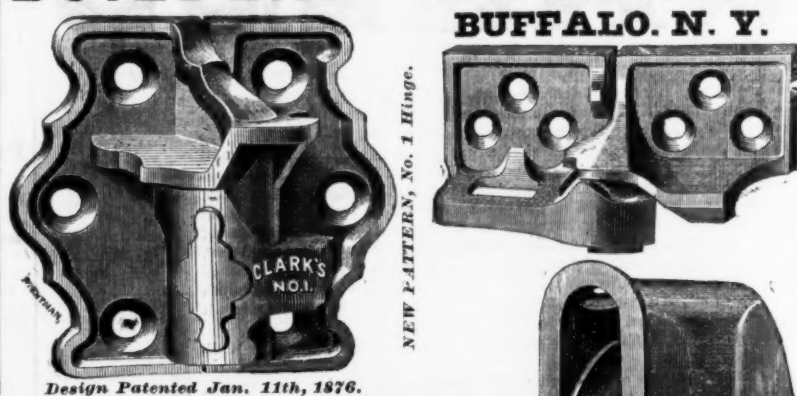
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Russia at the Centennial.

The exhibits from Russia have only been placed in position within the past few days, but the display may now be considered complete. In the Main Building the exhibit consists chiefly of articles in malachite, bronze, jewelry and furs. The general appearance as seen from the central aisle is one of great magnificence, equal to anything in the building, but the effect is not sustained upon a close inspection, although the display is a very creditable one throughout, and a surprise to any who may have supposed Russia to be only semi-civilized. The most striking feature of the exhibit at first sight is a gorgeous bronze chandelier of beautiful design and splendid workmanship throughout. The chief attraction, however, is the mantle piece, vases, tables, work boxes, &c., in malachite, by Hoeserich & Woerffel, of St. Petersburg. Some of these are of exquisite design and finish, and attract not only admiring crowds, but cash buyers, many of the articles being ticketed "sold," with name and address of buyer. The mantle piece at \$6500, a pair of vases at \$4500, and a small table at \$2400, however, are still for sale, but smaller articles, such as time pieces, work boxes, &c., go off quite rapidly at prices varying from \$35 up to \$1000. The tables have plain malachite tops upon gilt supports, richly carved and ornamented. There seems to be something magnetic in the character of the malachite, the deep rich green, with its shades of jet black, being irresistibly attractive. The work, however, upon some of the articles is very elaborate, and it is evident that in art Russia can take a leading position. The bronze figures by F. Chopin, of St. Petersburg, are also of great merit, and will take rank with the best in the building. In jewelry and silverware the display is exceedingly fine, Sazikoff, of Moscow, having the largest exhibit, while Tchetcheliev, Krumbelger and Adler, of Moscow, have also each fine displays, which for elegance of design, richness of material and skillful workmanship are worthy of great praise. The exhibit of furs is also very striking, Grunwaldt, of Riga, being the leading contributor. The display includes every description of valuable fur made up into ladies and gentlemen's wear, indicating the luxury and opulence of the upper classes. A number of fur bearing animals are grouped on top of the case; in the center a large Russian bear sits upright holding a leopard skin in his paws, and apparently invites some one to examine the article. There are other exhibits, such as hats, caps, &c., from Warsaw, and a case of gorgeous dresses for the clergy of the Greek church, but nothing of any special interest beyond what we have named. In Machinery Hall the Pooteloff Iron Works Company have a fine display, classified as follows: Finnish lake ores; pig iron from do.; puddled steel, in blooms, for steel headed iron rails; also for artillery shot; Martin steel ingots; Bessemer steel ingots, used for axles, tires, crank shafts, tools, &c. Samples of rolled bar iron; puddled steel, rolled into bars; Martin steel; Bessemer steel—all bent cold. Samples of iron rails fractured, also of puddled, Martin, Bessemer and phosphorus steel rails, 160,000 tons of which, we are informed, have been furnished to the Russian Railway in samples of bolts, spikes, fish plates and sole plates, of which 25,000 tons have been furnished. Railway steel tires, wheels on their axle, and an 11 inch conical shell, that has punched an 11 inch armor plate, are also displayed. These shells are produced by refining pig iron in the Bessemer converter. It is claimed that this mode of producing chilled metal has the following advantages: 1. To give a better purified iron. 2. The high temperature of the refined iron allows the metal to be cast quite free from slag. The following is a condensed description of the works of the Pooteloff Iron Works Company. The works are divided as follows:

In Finland.—iron works Ekaterina, iron works Oravi, iron works Hapokoski.
In St. Petersburg.—Rails and Mechanical Works, Arcadia Iron Works. The company produces in all these works pig iron, puddled steel, Bessemer steel, cast iron and brass castings, steel rails, tires, bar iron and steel, railway accessories of every description, artillery shells, steam engines, boilers, etc.
Rough Materials.—Iron ore in Finland worked up to 20,000 tons the year, producing about 6600 tons of charcoal pig iron. Old rails worked up to the amount of 2,300,000 pounds (41,600 tons) the year, old tires, axles, etc. The remainder of the materials used are partly Russian, or imported from abroad. As combustibles, wood and charcoal are used in the works of Finland, and generally coal in St. Petersburg.

The principal arrangements and plans of the works include: 7 hydraulic motors, 150 horse-power; 39 steam engines, 1980 horse-power; 33 donkey and other pumps; 4 blast furnaces; 27 puddling furnaces; 1 puddling furnace (system Pernot); 8 steel melting furnaces (Siemens' plan); 3 steel melting furnaces (system Pernot); 47 welding and reheating furnaces; 11 heating gas furnaces; 1 furnace, system Wilson, for the production of iron and steel direct from ores; 2 Bessemer converters; 8 cupolas; 2 reverberatory melting furnaces; 314 smith fires; 4 crucible melting furnaces; 66 gas producers; 19 blowing engines and fans; 16 rolling mills; 21 steam hammers, from a half ton to 7 tons; 344 mechanical lathes; 9 locomotives; 3 steamboats; 10 vessels, barges, etc. The company keeps in its works 40 engineers and foremen, 4000 workmen, permanently—6000 workmen for extra work.

Another fine display is that of Prince Demidoff, of the Neefing Taglisk Mining Works, and the arrangement of the exhibits extremely effective. Every description of iron, steel and copper is shown, as well as the ores from which they are produced. Sheets,

bars, plates, rails, ingots and tires, as well as bends, twists, knots and fractures, are displayed, showing the perfection to which they have brought this branch of business. The exhibit is very interesting, and some of the articles of special excellence, but, as in the department in the Main Building, the visitor will experience a sense of disappointment in looking for further evidence of Russian industrial skill. In fact, if the country is fairly represented, the impression is inevitable that the manufacturing interests of the country are monopolized by a few noblemen, and there is no general distribution of wealth or mechanical skill.

There seem to be no exhibits of machinery other than those representing the naval, artillery and engineering departments of the Russian government. These are chiefly models, among which we may name the model of the iron-clad Peter the Great, the dimensions of which are as follows: length, 330 feet; breadth, 63 feet; draught aft, 24 9-12; horse-power, indicated 10,000; plates, 14 inches; tonnage, 9065; and to carry 4 guns. Another model is of the circular iron-plated vessel, the Popoffka, 120 feet in length, 120 feet in breadth, 95 feet diameter on bottom, 16 inch plates, 3550 tonnage, 12 7-12 feet draught and 4000 horse-power. There are also models of the imperial yacht Livadia, and of a passenger boat running on the Volga, which, however, are in no essential point different to those of American build and design. Models of apparatus for steering, diving, floating docks, lighthouses, &c., are shown, and in connection with naval operations the display is both large and interesting. There is also a fine collection of scientific appliances from the Imperial Technical School of Moscow, which are used for the study of mechanical arts, but the exhibits throughout seem to be made either by the government or nobility, or else consist of articles of luxury, attainable only by a favored few, while the great mass of the people are unrepresented.

Map of the Chattanooga Mineral District.

We have received from Mr. S. B. Lowe, of Chattanooga, a copy of the large map of the mineral resources of the Southwest, of which we can speak in terms of high commendation. In the lithograph the original map, which is now shown at the Centennial, has been reduced to 30x36 inches, and although the location of the minerals is not yet on it, it shows correctly the contour of all of the mountains and rivers, as have never before been shown, and when the location of the minerals are fully shown, it will be of great interest. The committee are offering to get the maps published whenever a sufficient number are subscribed for at 50 cents each, to reimburse them for the expenditure.

Prof. Little, the State Geologist of Georgia, Mr. McCutcheon his principal assistant, who located all the minerals upon the Georgia part of the map, also Mr. Killebrew, well known as the author of "Resources of Tennessee," pronounce the whole result "wonderfully correct in every particular." Subscribers can now get this map at absolute first cost by sending in their subscription.

The following letter, signed by the officers and members of the Tennessee Centennial Commission, has been sent to us. We quote as follows:

"The committee to whom have been intrusted the getting up of the mineral map of this iron district, which is now completed according to the original plan, and on exhibition at Philadelphia, have experienced so much difficulty in obtaining the necessary funds to finish the map, that they have concluded to adopt a different plan to obtain the means to pay for getting 5000 copies lithographed, for distribution through the country, and at the Centennial. They propose to offer the map, lithographed like sample, with the addition of all the minerals represented by appropriate colors, as fully shown upon the original, to subscribers throughout the district, and to those who may feel interested in having it published, for the sum of 50 cents per copy; and whenever a sufficient amount is subscribed and paid to furnish the funds to pay for the lithography, the committee will order the work done, and the maps distributed to subscribers. Many have already intimated their willingness to take a considerable number for their own use and distribution among their friends, and have recommended this course to the committee. If subscriptions are promptly made there will be no difficulty in getting the map ready for distribution at the Centennial. It is understood that the samples now sent out are only the lithograph; the maps when furnished to subscribers will have upon them the location of all the minerals within the district, in appropriate colors, after the manner of the original map.

"It is very desirable to move in this matter at once, and those who feel interested should lose no time in sending in their subscriptions; and we feel that there is scarcely any one within the entire district but what the map would be invaluable to them as a reference, being as it is the only correct and reliable map ever gotten up of the section of country covered by it.

"All communications should be addressed to Mr. S. B. Lowe, secretary, and all remittances made to Mr. W. D. Van Dyke, treasurer, who will upon receipt of subscriptions, issue to subscribers a receipt, setting forth the object for which the subscription is made, and also the fact that should there be an insufficient amount subscribed, that the money will be returned in full to each subscriber."

The Ultimate Power of the Microscope.—Professor Abbe, of Jena, asserts that the limit of a microscope, in showing the structure of the tissues and the character of minute objects, has now been nearly, if not entirely, reached—higher power than that present in use giving rise to optical phenomena which are likely to completely mask the structure and nature of the object under examination. These observations apply more especially to the making of certain diatoms and striated muscular fiber. According, however, to the results arrived at by Professor Abbe, after prolonged and very careful investigations of the subject, by no microscope can structural parts be distinguished if they are so near to each other that the first bundle of light rays produced by diffraction can no longer enter the object simultaneously with the undiffracted cone of light.



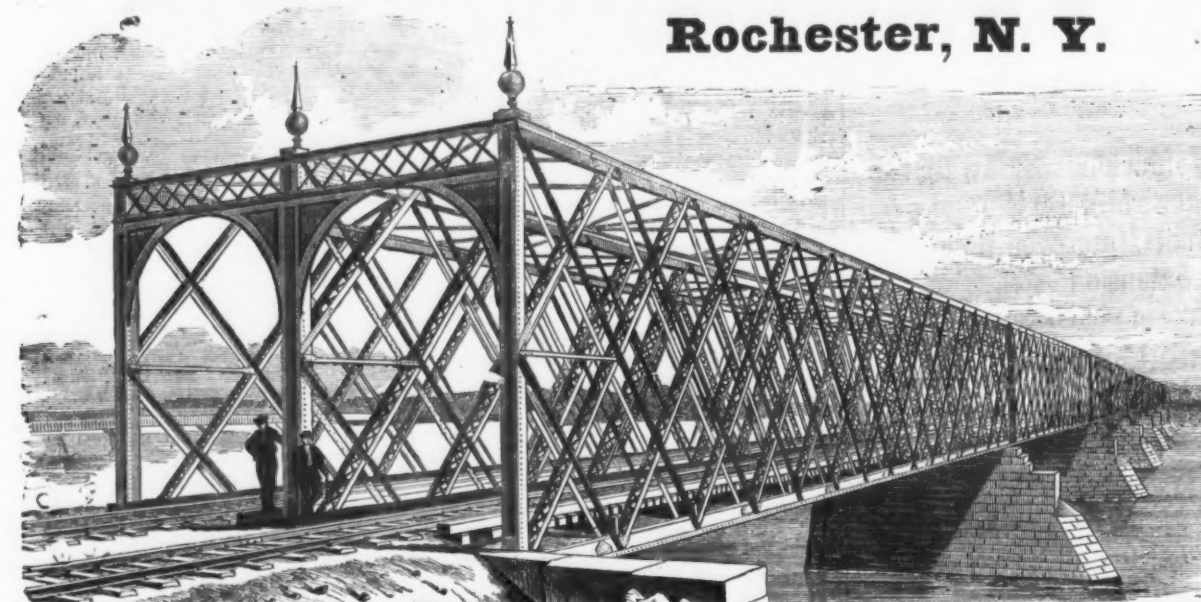
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 [Accompanying engraving represents the Springfield Bridge, built by the Leighton Bridge and Iron Works.]

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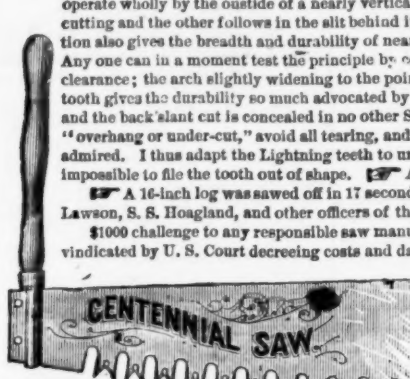
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Any Dealer is aware that in an ordinary Hand Saw, the front cut is the effective cut, and drawing back the saw has little effect by reason of the slant edges riding over the fibre, as the Saw is drawn back. The difference between the front cut of a Hand Saw, and the back cut, is the difference between the Lightning Saw teeth and all others; for all other saws are set one point and ride on slant edges. By setting two points of my M the same side and the next two the other, I conceal the slant between them, and operate wholly by the outside of a nearly vertical M tooth. Standing nearly vertical the two points of the M occupy the same space as the old V tooth. One point only is cutting and the other follows in the slit behind it to cut in the same manner, in the return motion, thus doubling the cut upon the same base and space of tooth. This construction also gives the breadth and durability of nearly an inch of steel instead of a single slender scraping point, and presents the upright instead of the slant edges to the timber. Any one can in a moment test the principle by comparing the front and back cut of any V tooth Hand Saw. My new patent of March 28th, 1876, allows the saw-dust perfect clearance; the arch slightly widening to the points of teeth renders it impossible for green or resinous saw-dust to be retained, while the slightly increased breadth at base of tooth gives the durability so much advocated by parties who have round-edged files for sale. Slightly pyramidal, the outer edges are as upright as the front cut of a Hand Saw, and the back slant cut is concealed in no other Saw than mine, by setting the two points of M to cut in line instead of alternately. Thus by this new Patent I avoid all "overhang or under-cut," avoid all tearing, and to the matchless speed of the Lightning dress and set, add the durability, simplicity of sharpening, and sweet cutting so much admired. I thus adapt the Lightning teeth to universal use, in all Hand, Pruning, Buck, and Cross-Cut Saws. The concave in the centre of the M saves files, and renders it impossible to file the tooth out of shape. A 10-inch Cant File and Set fitting the M is furnished for forty cents, that will file ten saws easily.

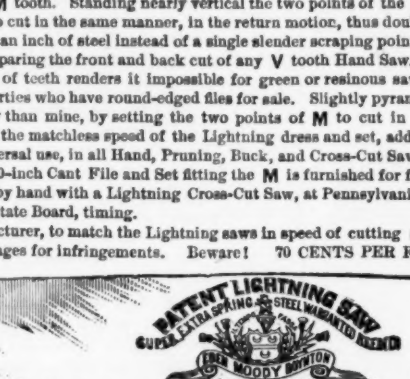
A 16-inch log was sawed off in 17 seconds by hand with a Lightning Cross-Cut Saw, at Pennsylvania State Fair, on September 30th, 1874, before President Eby; W. B. Lawson, S. S. Hoagland, and other officers of the State Board, timing.

\$1000 challenge to any responsible saw manufacturer, to match the Lightning saws in speed of cutting and ease of sharpening. This patent saw tooth has recently been vindicated by U. S. Court decreeing costs and damages for infringements. Beware! 70 CENTS PER FOOT. POOR GOODS ARE NEVER IMITATED.



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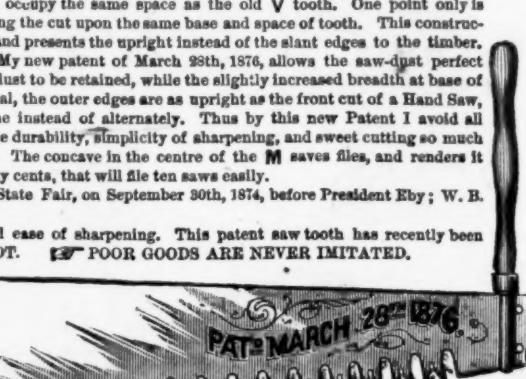
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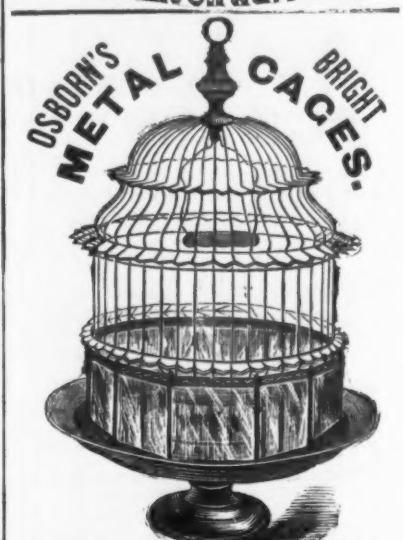
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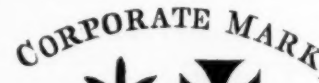
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&c. Manufactured by

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BUSINESS ITEMS.

MASSACHUSETTS.

The South Boston Iron Company is engaged in transforming twelve 10 inch smooth bore Rodman guns into 8 inch rifles for the War Department.

Kimball & Merritt, machinists, Abington, make tack and shoe nail machinery, heel machines, counter machines, heel presses, sole leather strippers, &c., and deal in shoe machinery of all kinds. They also own the patent and are making the Dunham quilting and riveting machine for nailing on the soles and quilting the bottoms of boots. It is meeting with very good success, taking the place of handwork. It will drive 500 nails a minute, all the way from a small counter sunk nail to a large hob or Hungarian one. They also are making a nailing machine adapted to all kinds of surface and channel work, which is capable of nailing on 1200 pair of soles per day.

The Abington Tack and Machine Association, formerly John Hyslop, Jr., are now engaged in the manufacture of tack and nail machinery of all kinds for all parts of the world, employing 12 hands and turning out 50 machines per year. They have also in running order 12 tack and nail machines for the manufacture of tacks, nails and brads.

The Knowles Steam Pump Works, Warren, have lately completed, for their display at the Centennial Exhibition, a miniature nickel-plated steam pump 13 inches in length, and is complete working order.

The Lowell Machine Shop Company are sending machinery complete for a cotton mill in Macon, Ga., in through cars from their works via the Merchants' Dispatch Line. The car trucks are changed at Louisville, Ky., those suitable for the five foot gauge of the Southern railroad being substituted for the Northern standard gauge. By this manner of shipment the machinery requires no transshipment. This is the first instance, we believe, of the shipment of unboxed machinery to the South from Lowell, and much lessens the cost of freight. Machinery for a large cotton mill, at Atlanta, Ga., will soon be sent via the same route.

PENNSYLVANIA.

Reis, Brown & Berger's mill is idle. There is a rumor that a well known blast furnace concern in the Shenango Valley is endeavoring to make a contract for 30,000 tons of native ore, similar to that used in the Wampum Furnace. With a mixture of half Lake this ore makes a splendid iron, and with one-fifth Lake it produces pig similar to the irons of the Allegheny Valley.

There is quite a breeze among the coke men. Some time ago a number of them formed a society for the purpose of regulating the sale of their products, and appointed a board of management. All went well until some of the parties found it more convenient to regulate their own sales, and some of them appeared to try the experiment. They tried it and raised a row in the camp, which led to the withdrawal of some of the members. Of course this raised a good deal of bad feeling, and now there is talk about suits being brought to keep the deserters in their place. How it will end we can't tell, but it is evident that the business will be done through its own channels again in a short time.—Connellsville Tribune.

The Keel Ridge Furnace, at Sharon, Kimberly, Carnes & Co., has blown out.

Mr. M. C. Herron, formerly of the Oransby Furnace, is running the Westernman furnaces.

An accident to the machinery at the iron works of Kimberly, Carnes & Co., at Newcastle, will cause a suspension of operations there until about the 10th of August.

Douglas Furnace No. 2, which has been in blast since last September, was blown out last Friday. The old Sharpville Furnace went out of blast on Sunday. This leaves but one furnace—Spearman No. 2—in operation out of the nine in Sharpville. This is in accordance with the programme stated some time since in *The Iron Age*. Ore must come down or pig go up before these furnaces will blown in again.

The Montgomery Iron Company's furnace at Fort Kennedy has blown out. This furnace has been in continuous operation for the past five or six years. It will be put in repair, but will not be put in blast again until there is a revival in the iron business.

The Waynesburg Independent says: The directors of the Washington and Waynesburg Railroad Company, at their meeting on Tuesday last, authorized President Richey to buy \$10,000 worth of iron. This is a judicious move, and looks to the final completion of the road.

R. L. Welcher, of Lebanon, has received an order from a party in Georgia for the construction of one of his Centennial blowing engines.

Seyfert, McManus & Co., McIlvaine and Craig & Koch are running their mills about three-quarters time.

The two Keystone furnaces of Bushong & Co. are the only ones running in and about Reading.

The F. & R. R. rail mills are running full capacity, filling an order for 62 lb. rails for the Delaware and Hudson Co.

The Aetna Iron Works (limited), Newcastle, are not running. They have had several breaks lately, and have stopped to put in new foundations.

Henderson & Co. are building 30 new coke ovens on their old works, Dunbar.

The chain factory at the Westernman Iron Works is one of the institutions of our town.

It is well worth a visit to the place to see the chain makers handle the iron and form them into links and the links into chains. The foreman and employees understand their business.—Sharon Herald.

Seven out of 77 coke ovens are in operation at Newcastle.

The Lochiel Iron Works, at Harrisburg, are supplying the rails for the Eminton and Edinburg Narrow Gauge Railroad, in the Clarion county oil district, and which is to be completed in October.

The iron rolling mill of the Lackawanna Iron and Coal Company, at Scranton, was the scene of a severe explosion Tuesday noon, during the absence of the workmen at dinner. A large quantity of gas, owing it is said to the temporary inaction of the furnaces, accumulated in the main blast-pipe, caught fire and exploded with terrific force, tearing the pipe to fragments, and shattering the roof and walls of the building in which it was confined. No lives lost.

PITTSBURGH AND VICINITY.

The United States Iron and Tin Plate Company report orders as accumulating.

Shoenberger & Company are shipping horse shoes to the Schuylkill Arsenal. Their shoe was adopted by the Board of Examiners of the United States army, at a late session, as one of the shoes to be used in the army.

The Westinghouse Air Brake Company has presented each of its employees with a ticket to and from the Centennial.

Palmer's Mill is idle for repairs.

OHIO.

The Zanesville Furnace, Ohio Iron Co., blew out last week after a continuous blast of nearly four years, the fire never having been out of her in that time. This, for a coke furnace, is a grand record.

The salamander of No. 1 blast furnace of the Cleveland Rolling Mill Company has now been cleared out. Three very heavy pieces were blasted out by means of the dynamite. One piece, weighing over 6½ tons, was hauled away in the dump, and two pieces, weighing over 10 tons each, have been buried in the cast house, being too heavy to haul away.

At the machine shops of Tapin, Rice & Co. there has just been completed the largest pulley ever made in Akron. It is for the Cascade Mills of F. Schumacher, and weighs 7 tons. It is 14 feet in diameter and has a face of 42 inches in width. It was cast in two separate wheels and then bolted together through the center. At the same shop a core wheel, 12 feet in diameter and weighing 7300 pounds, is being turned out to be used in the same mill as the other.—Beacon.

Baughman, Curtis & Co., Toledo, recently made two large heaters, of extra size for the Union Rolling Mill Co., of Chicago; the heaters are 5 by 14 feet and the filter 4 by 5 feet in size. The filter is used in purifying the Chicago River water for use in their boilers. A saving of fifteen tons of coal per day is reported in the use of the heater and filter. This firm manufactures the Armstrong heater, filter and lime extractor combined; also, Perkins steam stationary fire and tank pumps, and power and steam boiler faced pumps. They have 35 men in their employ, the annual product of the works being equal to about \$60,000. They occupy a four story building 33 by 132 feet in size, with an L 86 feet long. They find a market in all parts of the United States.

Washington Furnace, in trying the stone-coal experiment, came near chipping up last week.

Scioto Furnace, after having in vain tried to run on a fire brick hearth, has now put in one of sandstone and is doing well. She pays but 4 cents for charcoal.

KENTUCKY.

Raccoon Furnace is now in blast making a good quality of charcoal iron. Her experience in stone-coal iron, though demonstrating the fact that her stone-coal is well adapted for the manufacture of that class of pig iron, being the equivalent of that of Jackson, has not been a financial success, which is mainly due to the size and shape of the furnace. Still her lessee and manager, Col. Worthington, deserves much praise for his untiring efforts to be as successful with stone-coal as he had been with charcoal iron making. The greater part of the charcoal now used is made on the furnace bank, whether the wood is hauled from near choppings. This reduces the cost of charcoal very materially, and enables the furnace at the same time, to make a better yield on the wood and obtain a fresh smelting fuel almost directly at the tunnel head.

Hunnewell Furnace will blow out next month to put in a new hearth.

Pennsylvania Furnace is now working very satisfactorily. She had some trouble with a tuyere burning out week before last, causing a little back-set, but is now doing as well as ever.

The Tygart Valley Iron Co., say: "The cost of charcoal would not exceed four cents per bushel, so that the cost of making pig iron would be amply paid for at \$13 per ton at the furnace, including all expenses. Add to this \$4 for transportation, and the iron could be delivered at Riverton, on the Ohio River, at a total cost of not more than \$17 per ton."

The Louisville Car Wheel Works are running on full time, and doing an extensive business in their line.

TENNESSEE.

The Chattanooga Saw Works have rented one of the Stoops buildings on Market street, where they will soon be in readiness to begin operations.

MICHIGAN.

The shipments from the Lake Superior ore district, for the week ending July 19, are as follows:

Place.	1875.	1876.
From Marquette.....	192,347	181,315
From Escanaba.....	93,706	143,392
From L'Anse.....	33,430	26,967
Total.....	309,483	351,673

Showing an increase of 42,328 gross tons.

MISSOURI.

The extensive steel works which have been in process of erection by the Vulcan Iron Works Company for some time past, at South St. Louis, were completed on Tuesday, and made their first "blow." These works are for the exclusive manufacture of Bessemer steel rails, costing some \$600,000, and are reported as having large orders to fill.

The gas well now sinking at the Cotton Press, foot of Chouteau avenue, St. Louis, by Nixon & Gere, is making rapid headway. The depth at this date is about 175 feet. Very promising thin slate layers have been passed through.

A Canal Over the Alleghenies.—The Philadelphia Times says: For the space of one hundred years there has been in almost perpetual agitation a scheme of running a canal over the Alleghenies to connect the Potomac River and the Youghiogheny. Gen. Washington first conceived it, and became the first president of the Potomac Company. The illustrious General Simon Benard, Secretary of War of Louis Philippe and a staff officer of Napoleon, surveyed the route about 1817. The canal has been completed to the coal field at Cumberland, and sends coal to Washington city for about fifty cents a ton tolls. It will cost to run it over the mountains, \$50,000,000, with very doubtful probabilities of securing water enough to float the barges at that great height and effect the monstrous lockages. The last performance in this direction is the private enterprise of Senator Henry Davis. He has cleaned out the channel of the north branch of the Potomac, a narrow, rock strewn torrent, which rises at the Fairfax Stone, and is often nearly a dry bed. This river runs along the southern base of the Backbone Mountain, whose scarp is covered with large timber. Davis hoped to make the stream carry off the logs he should fell on the mountains, where he has bought a vast tract of timber—from 30,000 to 50,000 acres, at less than two dollars an acre—but the water has not been sufficient to fully carry out his objects.

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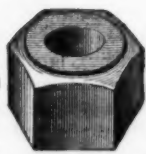
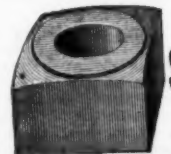
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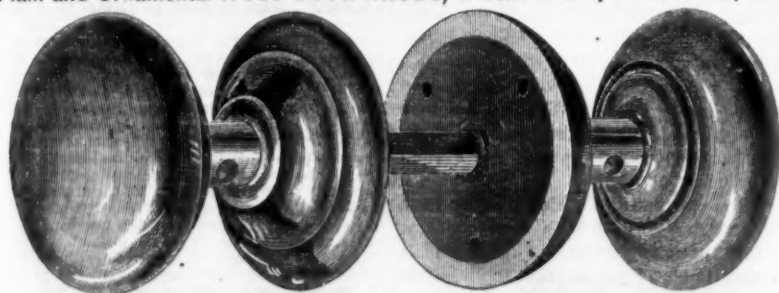
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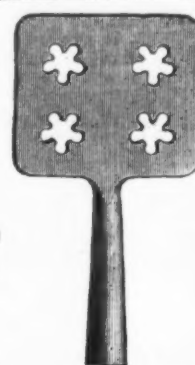
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The Problem of the Hour.

During the past few weeks we have devoted a liberal share of our editorial space to the discussion of what seems to be the most serious question of the time—what can be done for the unemployed labor of the country. We have shown by argument and proved by facts, that no general diversion into agriculture of skilled labor from the manufacturing industries, nor of unskilled labor from the occupations which our rapid internal development has so largely stimulated since the war, is practicable. Were such a diversion forced, or even permitted, we should see the whole country overrun with "tramps," as some parts of the West already are. We have further shown that, in our judgment, provision for the employment of idle labor must be made where that labor is found, and that we only make a bad matter worse when we transform the resident pauper into the vagrant. He is a pauper in either case, but in the one he can be systematically dealt with, while in the other he can more easily elude the laws for the suppression of pauperism, and his restoration to useful citizenship is surrounded with difficulties so great that it is commonly regarded as impossible of accomplishment.

Under existing conditions, it may be assumed that the skilled and unskilled labor of the country cannot find employment in its accustomed occupations. The manufacturing industries are suffering from a partial paralysis, the building trades are at a standstill, railway extension and public improvements are indefinitely postponed, and labor stands with idle hands in empty pockets waiting for the long hoped for, but long delayed, improvement in general business. The number of men and women who, pending such revival, can manage to make a living in one way or another, though large in the aggregate, is small in proportion to the number seeking employment. Were the public fully aroused to the importance of finding work for as much of this idle labor as possible, we have no doubt that the number who cannot find work would be greatly reduced, but there would still remain a vast army of paupers—larger now than ever before in the history of the country—which must be provided for. They are now roaming about from place to place, singly or in companies; they are swarming like locusts in the agricultural districts, and maintaining a reign of terror over the farmers and town authorities, committing depredations in all directions, and everywhere terrifying women and children, upon whom they have committed unnumbered outrages. This is not an evil which will cure itself. Unless we promptly stamp it out, it will quickly attain the proportions it reached in Belgium in the latter part of the last century. There is already a startling parallel between the newspaper accounts of the condition of affairs existing in the tramp infested districts of the West, and that reported in Belgium when Count Rumford entered the service of the Duke of Bavaria in 1790. The Count says: "The number of itinerant beggars of both sexes and all ages, as well foreigners as natives, strolling about the country in all directions, levying contributions from the industrious inhabitants, stealing and robbing and leading a life of indolence and the most shameless debauchery, was quite incredible." Equally incredible seems the well authenticated stories daily received from the West, of tramps moving in companies of from 100 to 500, taking possession of railway trains and rendering the carrying of armed guards by the railroads a necessary precaution for the protection of passengers. Rumford further tells us that the Belgian vagrants were "stout, strong, healthy, sturdy beggars, for the most part." The country was overrun with them. Children were stolen and maimed, crippled or disfigured to make them objects of sympathy; life and property were both insecure, and the evil had reached such proportions, in spite of numerous unsuccessful efforts to suppress it, that begging had become "in a manner interwoven with the integral relations of society." In four years 10,900 were arrested and handed over to the civil magistrates, and in Munich alone there were 2,600 beggars out of a total population of about 60,000. The people were so tired and discouraged that every proposal for remedy was looked upon as "a mere job," and until Rumford took hold of the evil it continued to spread steadily. Its ramifications were so extensive and far-reaching that its reformation seemed impossible. The beggars organized what amounted practically to a government of their own, and levied onerous taxation upon farmers and tradespeople. The vice permeated all classes of society, and people employed in many occupations had their wages graduated in proportion to the extent of their opportunities to beg. Shepherds, children of farmers living along frequented highways, servants in cities, and in fact every one who had opportunity, joined the great army of beggars. This was the condition of affairs when the wonderful man from whose writings we have gathered these facts, undertook the task of suppressing mendicancy. Knowing, as he did, that the people had but little faith in the efficacy of measures to rid the kingdom of beggars, he determined, as he quaintly says, first to do it and then ask them to support him in his undertaking. The story of his labors and their results not only possess exceptional historical interest, but they have a direct practical bearing upon the problem as it now presents itself to us in this country.

Count Rumford was a military man, and his first step was the organization of the army. In doing this he accomplished what had never been done before, that is, he encouraged the soldiers to work. We cannot go into the details of the plan by which he made the army a vast industrial system, but it possessed this advantage over any other military establishment ever organized: while not interfering with the efficiency of the soldier or his availability for military service, it did not withdraw labor from either agriculture or manufactures to any appreciable extent, and while

the army was apparently an expense to the country, it would probably have been found more than self-sustaining could all the benefits of the system and its ramifications have been taken into account. Having put the military establishment on this basis, his next project was to rid the country of beggars and make the pauper population not only self-sustaining but contributory to the public good. The army was largely made use of in policing the country and arresting the vagrants. On the 1st of January, 1790, Count Rumford personally made the first arrest with his own hand, his reason for this being to set an example which the soldiers would not be ashamed to follow; and in one hour's time the streets of Munich were cleared of beggars. Realizing that imprisonment would not reform vagrants, he set about the task of changing their tastes and desires. To quote his own words—his first object was to make them happy; the second, to make them virtuous. They were washed, fed and set to work at some useful employment in large, comfortable and even "elegant" workshops provided for the purpose, and an effort was made to make the paupers feel that they had been elevated to a higher plane than that from which they had been taken. On account of their awkwardness and ignorance of all kinds of useful employment, it was necessary to encourage them by paying them comparatively high wages for what little they could do, and in order not to discourage them when it was necessary to obtain the results of their labor at a lower price, they were transferred to other kinds of work in which their greater skill rendered their labor more remunerative to the State, and at the same time more profitable to themselves. It must not be supposed that these institutions were prisons. They were government workhouses, in which employment was offered to those who were restrained from following the only trade they knew—that of begging. No one, so far as we can learn, was compelled to go there and work, and no one was obliged to live in the government buildings who had a home elsewhere; but they were such pleasant places of residence that they were generally preferred to homes in the tenements of the city. No one could beg, and the only alternatives were to work or to starve. The system worked perfectly, and before the public were fully aware what the Count was about, he had extinguished the evil which had so long menaced the life of society.

The funds necessary to carry out this gigantic undertaking were, in the first instance, obtained from the sovereign. When its success was established, voluntary contributions began to pour in. Legacies aggregated a large sum, and finally the money realized from the sale of articles made in the workshops were added to the income. After the system had become thoroughly organized, the workhouses not only became self-supporting, but earned a revenue for the state.

The work which Count Rumford, a New England engineer accomplished so promptly, successfully and economically in Belgium three-quarters of a century ago, was a thousandfold more difficult than that which devolves upon us at this time. The evil we have to contend with is similar in kind to that which then existed in Belgium, but it is by no means so extensive or deep rooted here as there. If it was possible to suppress pauperism then, it is also possible now. Sentimental considerations should not be allowed to interfere with the adoption of prompt measures for the extermination of vagrancy. If men cannot find work for themselves, we must find it for them, and whatever the industrial condition of the country, vagrancy and pauperism are crimes against society which society cannot afford to tolerate. We must first give a man a chance to work for his living, and then compel him to choose between the alternatives of labor and starvation.

It would not be practicable now to follow in every detail Count Rumford's plan, but our charitable and reformatory systems must be organized upon the same principle if we would have them in any degree successful. We commend to all who are interested in the subject a careful perusal of Count Rumford's account of his work in Belgium, which will be found in his published writings.

The Paris Exposition of 1878.

While the situation in Germany is one of general prostration and anxiety amounting almost to panic—the reaction from the intoxication of speculative excitement following the payment of the war indemnity—France is in the enjoyment of a very comfortable general prosperity, and her people are manifesting a great deal of energy in pushing forward many large and promising undertakings. The city of Paris

has lately contracted a loan of \$24,000,000, and the securities issued were bid for at 16 to 17 per cent. premium, even before the terms and conditions of the loan were known. The amount subscribed was far in excess of that called for, and the people were eager to invest. The same spirit of enterprise is manifested throughout the new Republic, and the nation's recovery from the ruin and humiliation of disastrous defeat in war is to be celebrated in 1878 by a second Industrial Exposition on the Champs de Mars, Paris, which promises to overshadow the Centennial Exhibition. From a report of the Minister of Commerce, lately submitted, we gather some interesting details. The buildings are to cover an area of 240,000 square meters, arranged like the squares on a chess board. The products of the exhibiting nations will be arranged longitudinally, so that the visitor, proceeding transversely, can find in line all the products of a given kind belonging to the different nations. This is a much better system than has been observed at Philadelphia, where the arrangement seems to be utterly promiscuous, and certainly is utterly confusing. It is estimated that the buildings and improvements to the grounds will cost over 35,000,000 francs, which is about 12,000,000 more than were expended upon the Exposition of 1867. As the total receipts, including the proceeds from the sale of buildings and materials, are estimated at about 19,000,000 francs, there will be a deficit of something over 16,000,000 to be provided for, which will be met by an appropriation from the national treasury. Whether the world will be quite ready for another international exhibition two years hence may be considered doubtful, but the French people have unbounded faith in themselves and in the attractions of their gay metropolis, and as two years afford time for many changes and much progress in this age of steam and thought, the second Paris exposition may be even more successful and profitable than the first. Probably the number of Americans who will go to Europe in 1878 will be greater than the number of Europeans who have come or are coming to our Centennial, but we fear that the representation of American manufactures and art products will be small, unless the large hopes of commercial benefit are more fully realized in the results of the Centennial than they now promise to be. The people of this country have had about as much international exhibition as they can digest for some time to come, but the number of our citizens who would avail themselves of any reasonable excuse for a summer excursion to Paris is legion.

The Lead Markets.

European lead production has varied little of late years; from 253,000 tons it has gradually reached 265,000. In England it has fluctuated between 54,000 and 70,000. Spain has kept tolerably steady at 67,000, while the German output has been on the increase, rising from 49,000 to 62,000 tons. Whatever increase there was has been absorbed with ease by the growing demand for purposes of armament, the introduction of water-works and lead pipe in many cities of central Europe, and a steady trade in the metal with China and other Eastern countries. But notwithstanding the fact that distribution to actual consumption, as well as export, suffered no important diminution, but came fully up to the liberal scale of production, the metal has not been as well sustained as it was last year, when from £23. 15/ English pig was way but £1, closing at £23. 15/; while this year it has by degrees declined to £20. 5/.

The decline since the beginning of this year has to be attributed rather to general than to special causes. There has been a dull feeling in metals in Europe, and lead has not been an exception. The continual failures in England and on the Continent have spread great apathy through all branches of trade and killed speculation, despite the abundance and cheapness of money. The winter on the other side was an unusually long and severe one, and when at length spring trade opened, the political horizon became overcast, much to the detriment of commerce. Both dealers and consumers consequently showed indifference to replenishing stocks, although as regards lead in particular it was generally admitted that they had been permitted to run low. Only within the last week, according to cable dispatches received, has the market over there assumed a somewhat brighter aspect, in consequence of government purchases made for French and Russian account.

The events on the Turkish frontier have been reported to us in such an incoherent and contradictory shape that it is difficult to determine as yet whether the war will assume larger proportions and draw in some of the great powers or not. It seems

certain, however, that armament by all of them is going on uninterruptedly, and lead is strengthened by the reappearance of purchasers for that purpose.

With us production has been making headway much more rapidly than in Europe, as will appear from the following comparisons:

AMERICAN LEAD PRODUCTION.			
	Tons.		Tons.
1866.....	14,312	1871.....	17,854
1867.....	13,662	1872.....	23,106
1868.....	14,636	1873.....	46,661
1869.....	15,653	1874.....	63,219
1870.....	15,922	1875.....	53,000

We have nearly quadrupled our output in ten years, and more than doubled it since 1872. This has enabled us to gradually dispense with foreign importation, except in cases in which the drawback held out an inducement, and soft lead of American production is superseding by degrees that formerly imported for corroding purposes, thus rendering us pretty much independent of the European market. A good deal of the profitability of mining argentiferous lead in Utah and Colorado would, of course, be lost should silver further decline, but we do not believe that production would be seriously curtailed thereby. Lead production in the United States has become an element of national activity so singularly favored in other respects that the transient fluctuations of silver, or even its permanent depreciation, cannot well hamper it. With a revival in business and building our capacity of consumption will grow fully up to the increased production, one item, that of white lead alone, requiring upward of 45,000 tons annually in times of normal industrial activity.

In our own market the spring trade in lead has again been a disappointment, yet prices, after opening at 5.90c., gold, early in January, rose to 6.50c., to 6.62½c., gold, in March and May, and receded to 6.25c., gold, where they have remained. The advance was mainly brought about by speculation; without its interference we should, in all likelihood, have stayed where we began, by reason of the general inactivity and rather liberal supply for the West, favored by exceptionally low freights.

The lead market on this side will now be put to a fresh test, on the advent of the fall demand for shot, etc. If appearances should prove encouraging, speculation may step in once more, and a short excitement, accompanied by an advance, may ensue, especially should the European rebound prove lasting. Without some such external help we do not expect much beyond a bare maintenance of prevailing rates, even assuming that this time we are to have a brisker fall demand. Consumers, it should be added, foreseeing a more active fall trade than we had last year, have actually begun to secure quite a supply, mostly "to arrive," amounting to some 1000 to 1300 tons, all bought within the past eight or ten days at current prices.

Over-Production or Under-Consumption.

We are glad to see that *The Iron Age* is no longer alone in the position it has assumed since the "hard times" began, that the trouble is not with production but with consumption. The Chicago *Inter Ocean* of July 27th has the following:

For many months a persistent yet utterly false outcry has come from a portion of the press of the country, particularly from the newspapers of free trade proclivities, that the long-continued disorganization of industry and trade is attributable to over-production. As proof, we are pointed to warehouses crowded with goods which cannot find purchasers; to manufacturing establishments running on part time, with a reduced force of working people; and to the multitude of laborers who cannot obtain employment. Still, we do not see how these facts support the argument, because the use made of them necessarily implies a direct and emphatic contradiction of a universally admitted postulate of political economy—of a fundamental proposition admitted equally by all the different schools of the science—that production is the only source of wealth. The allegation that we are growing poorer by producing too much is to us an insoluble paradox; for it sounds very like a man claiming that he is involved in serious pecuniary embarrassments because he has cleared too much money. The greater the quantity of things produced in the United States the greater must be the aggregate of wealth. When the results of the census of 1870 had been declared, the figures were welcomed with pride and exultation, as showing signal progress in the accumulation of property through the activities of production, and as indicating a more rapid increase of wealth than in the previous decade, notwithstanding the vast waste and destruction of both values and lives during a protracted and great civil war. It now seems to be in order among a certain class of people to deplore such a movement of the productive forces, accelerated in pace, as a misfortune, and as the true source of the existing stagnation of business in this country. Such a position is extravagantly nonsensical. Nothing should be plainer than that over-production cannot take place so long as human wants for the things produced remain unsatisfied, and that each person's share in the general work of production supplies him with the means of gratifying his needs or his desires. Are the masses of our people to-day so fully furnished with those articles of convenience, comfort or luxury of which it is said there is an over-production, that they feel no lack? Unless this be so, there must be under-consumption, not over-production. If there are hundreds of thousands of individuals who would like to own a piano, or a sewing machine, or a new suit of clothes, or what not, but cannot afford the purchase, because they have lost employment and wages, or because the profits of business have seriously fallen off, then the glut is only seeming, not real.

In 1872, when there was a great abundance

of all things, very much greater than now, and production was exceedingly active, there was not any complaint of an overwhelming surplus. What is now the matter is under-consumption. Some 2,000,000 men and women are compulsorily idle, who then were regularly employed. The earnings of these people amounted probably, as a total, to \$5,000,000 a day, or to \$1,500,000,000 a year. This purchasing power, vast in the aggregate, has disappeared from the market of trade, depriving of a market a vast quantity of articles that otherwise would have been purchased and consumed. Production itself declines because of this extensive failure of demand. Restore the lost purchasing power, in the shape of wages paid for daily work, then what is unreasonably styled over-production would vanish. For awhile, what would need to be termed under-production would supersede the so-called over-production. If all the idle laborers could be set at work, and kept at work, the industrial movement would soon get safely on its legs to stay there, and thrift with contentment would once more visit a stricken land. The rapid circulation of commodities, attainable only through steadily employed labor at good wages, constitutes the material prosperity of our national life. Meantime, enough things are not produced to satisfy the wants of the people. There are more mouths to be fed, more backs to be clothed, more feet to be shod, more heads to be sheltered, more bodies to be warmed, and more minds to be instructed, in 1876, than there were in 1872; yet the quantity of things produced is smaller. The over-production is apparent, not real—constructive, not actual—a ratio between production and the crippled power to consume, not between production and the urgent needs of consumers. It may be added that this allegation about over-production, as the cause of the present disorganization of industry and business, has proceeded from those who favor a system of partial free trade, and who claim that protective duties on imports inevitably lead to scarcity—a self-contradiction which is superlatively ridiculous; for how is it possible for a tariff system to tend unavoidably to scarcity, yet actually end in superabundance—in excess of manufactures—in over-production? We leave this absurd paradox to be solved by those who think they can solve it.

So far as regards the cry of over-production, the above agrees perfectly with the views expressed in our issue of July 6th, in an editorial entitled, "Are we Suffering from Over-production?" We do not believe, however, that the advocates of complete, or partial, free trade are responsible for the cry of "over-production." On the contrary, we have found the idea firmly planted in the minds of life-long protectionists, especially manufacturers. It is in the fullest sense a popular error, and those alone are responsible for its currency who cannot, or do not, reason beyond the fact that we have a present supply of useful commodities in excess of the present demands of trade.

It by no means follows, however, that because over-production is impossible, so long as there are unsatisfied wants or ungratified desires for the article produced, that it is the part of wisdom for the manufacturer to go on producing what he cannot sell. He must, in all cases, be governed by the demand which he aims to supply. Suppose he is a manufacturer of stoves, and his foundry is capable of turning out 50,000 stoves in a year. There may be, at a reasonable estimate, two millions of families who want new stoves, and if they had anything to give in exchange for them which the manufacturer or the dealer would accept, they would purchase them at once. The manufacturer knows, however, that under existing conditions the wants of a very large proportion of those needing new stoves must remain unsatisfied for the present, and he has no other recourse but to limit his production to the number of stoves he can reasonably expect to sell. It makes, practically, but little difference to the individual manufacturer, so far as his immediate policy is concerned, whether over-production or under-consumption compels him to limit the number of stoves he produces; but it makes a vast difference as affecting his forecast of the future. For the present he must make no more stoves than he can sell, economy in production must be looked after down to the smallest detail, and he must encourage a larger consumption by reducing the cost of his goods to the very lowest point at which it is possible for him to make them. Because a great many more people want stoves than buy them, does not justify him in making more stoves than he can sell. The same remarks apply with equal force to all other departments of manufacture. Good business policy will lead the manufacturer to restrict production when consumption declines, even though the actual unsatisfied wants of the community are far in excess of our ability to supply them were production carried on at the maximum of our capacity.

The Value of Skill to the Mechanic.

It has been often asserted that one of the many bad effects of trade unionism in the mechanical trades is the establishment and maintenance of a dead-levelism among mechanics which would not exist were the competition among men unrestrained by arbitrary rules and regulations fixing wages at so much for a day's or an hour's work, irrespective of the amount which the mechanic is able to accomplish in that time. There is much of justice in this complaint, which, however, seldom comes from those most affected by the evil complained of—the mechanics themselves. In seeking a reason for this seeming content-

ment with a system which is calculated to restrain the ambitious mechanic and place skill and industry on a par with ignorance and indolence, we conclude that the workingmen do appreciate the nature and extent of the evil to which they quietly submit. It is, of course, quite satisfactory to the unskilled, careless and indolent, whose only desire is to earn the most wages for the least work; and as these constitute an unfortunately large majority in many trades, it is not to be wondered at that the influence of the unions is exerted to maintain this unnatural equality, by which inferior workmen derive some benefit from the exceptional skill of others which goes to raise the general average. The skilled workmen, on the other hand, probably think that as they must perforce stand on a level with those less skillful than themselves, they gain no personal advantage from their efforts in the direction of self-improvement; and the apprentice, feeling that the end and aim of his apprenticeship is graduation into the ranks of the journeymen, in which one man is as good as another, has little incentive to study or devote special attention to the acquisition of a knowledge or dexterity above the average.

If such opinions are entertained by our mechanics or apprentices, we think it will be easily shown that they are reached by illogical reasoning from false premises.

From the most selfish of motives, the workman would find it better for himself to attain the highest possible degree of skill, rather than be content to drag along at the level of the ordinary journeyman. The finished workman accomplishes a given amount of work not only more quickly but with less physical exertion than the half skilled mechanic. He is master of his work, and is never annoyed by finding that it has mastered him, a thing which is constantly happening to the ordinary journeyman. In many branches of business, the amount of work done by the man who does not understand his trade is many times greater than is necessary, and here is the reason which appeals to him in the most direct way, urging him to become more skillful. The best man is the most valuable to the employer, and, although he may not earn wages in proportion to his value as compared with others less accomplished, he is parted with reluctantly and only in case of necessity, while the slovenly, half skilled mechanic is dispensed with as soon as he can be spared, and often to make room for a better man. The poor workman is never wanted anywhere, nor by anybody; he is tolerated when the demand for labor is great, but that is all. This is something which no trade union can change. The interest of the employer is with the best man, and he will take the greatest pains to keep him, and, while the action of the union may prevent the payment of any larger wages to one than the other, yet it will be found in the end that the best man has made the most money and has had the easiest time.

The skillful, industrious workman is always in the line of promotion. It is to him that the chances for getting into an "easy place" always come. If a foreman, or overseer, or man for special work or duty is wanted, the best workman, other things being equal, is generally the favored one. It is no unusual thing to have employers say of a particular workman of exceptional skill: "No money would tempt me to part with him." This, of course, is an exaggerated form of expression, but it means that the man in question is sure of a place so long as the employer has any work for him to do, and that his chances for promotion are good as soon as there is a vacancy to be filled. We call to mind a case in point. In a large shop in New England there was a bright young man working at the bench, who had just completed his apprenticeship. He was a journeyman, getting just such wages as the others, and content to work as they did. The superintendent watched him for awhile, and concluded from his general bearing, his industry and his thoroughness, that he had in him the stuff of which master workmen are made. One day the superintendent stepped up to his bench and said: "Do you ever expect to do anything more than work at your trade at so much per day?" "No," was the answer. "Did you never think that you might get up so as to take charge of men?" "No," was the answer a second time. The idea had never before entered the young man's head. He thought about it, however, and that winter, as we happened to know, his evenings were divided between drawing lessons and the night school. In working hours he devoted himself not only to his work, but to learning the details of the trade, and to making himself a thorough workman. In this he succeeded, and it was not many years until he had risen from the bench and taken a position of honor, responsibility and profit.

The man who starts in life with the determination to make himself a thorough mechanic, not only has more chances for steady work than the man content with half knowledge, but he has incomparably better chances of becoming an employer. He makes more money, can lay aside more, and, when there is a business opening, he is better able to step in and fill it. Capital is constantly on the lookout for investment in connection with skill and thrift. The slouch or shirk who barely acquires skill enough to pass for a journeyman when times are good, may think that he is just as well off as though he had mastered the trade, but his punishment comes quickly when trade grows dull. He never knows the security of feeling which the good workman has, in knowing that his trade is a sure dependence, even in times like these.

We think the considerations above presented are strong enough to influence any thinking mechanic to make self-improvement his constant thought. They certainly should be strong enough to influence the ambitious apprentice to seek the success to which he looks forward by the only means by which such success can certainly be attained. The world is full of disappointed men who bewail the lost opportunities of youth. They were content to let these opportunities pass unheeded, only to regret later in life, when every energy must be devoted to winning scanty support for their families, that the position in life they have made for themselves is very different from that to which they hoped to attain.

Hardware at the Centennial.

Main Building.

MARX BROTHERS,

No. 430 Broadway, New York, exhibit in a very tasteful manner handsome specimens of Young's patent folding scissors. They show these goods in gold, silver, nickel finish and bright steel. These scissors are so constructed that they fold into a very small compass, and can be carried conveniently in the pocket without injury to clothing, the points being completely protected when folded. Each scissors is provided with a neat leather case.

BAILEY WRINGING MACHINE CO.,

No. 99 Chambers street, New York, exhibit a good assortment of their "Defiance" metallic planes, box scrapers and spoke shaves. They show these planes, which are all presented in good commercial finish, in the following varieties: Block planes, smooth planes, jack, fore and jointer planes. They also show a circular plane, with adjustment, having a flexible steel face, which admits of its ready adjustment to any desired circle, either concave or convex. They claim for this tool that the adjustment is stronger, works slower, and with less "backlash," than any other tool of its kind in the market. This company manufacture their own plane irons from best quality steel made expressly for this purpose. Each iron is turned out in perfect working order and is fully warranted. The assortment of metal frame spoke shaves is large, and these are shown with both straight and raised handles.

MANNING, BOWMAN & CO.,

West Meriden, Conn., have on exhibition a large assortment of polished tin, copper and Britannia metal hollow-ware, comprising a variety of nickel-plated and block tin urns, copper urns, Britannia metal water pitchers, hotel urns, tea and coffee-pots in Britannia metal and polished tin, swinging kettles, castors, molasses pitchers, nickel-plated hotel sets, butter dishes, &c.

KEYSTONE HARDWARE MFG. CO.,

Reading, Pa., display a large line of cast and malleable iron hardware, among which we notice axle or frame pulleys, screw pulleys, barrel bolts, Japanned and lacquered hat and coat hooks, ornamental brackets, a very fine assortment of imitation bronze window fasteners, drawer pulls and shutter lifts, ornamental spring bolts, flush bolts, brass hat and coat hooks, door handles, &c. In real bronze hardware they also exhibit good patterns of sunk and knob and slide flush bolts, door knobs, bell pulls, drop handles, barrel and chain bolts, window fasteners, hat and coat hooks, store door handles, escutcheons, finger plates, letter box plates, &c. They also exhibit their Centennial apple parer, and a sausage stuffer and lard press.

HARRISON & KELLOGG,

Troy, N. Y., show excellent specimens of malleable iron castings, and a handsome line of well made screw wrenches, both black and bright finish.

THE NEW YORK KNIFE CO.,

Walden, N. Y., make one of the handsomest exhibits of pocket knives, as well as showing the largest assortment of these goods to be found in the Exhibition. Their goods are shown without any attempt at elaborate display, but it is impossible to look at the immense variety without feeling something akin to astonishment at the wonderful detail the manufacture of these goods in all the various styles required by the trade in different sections of the country demands. Their display of pen and pocket knives comprises from the cheapest one blade cocoa and brass handled knives to the finest productions in shell, pearl and ivory, with one, two, three, four and six blades that are known to the trade. They also show handsome combination knives, a fine assortment of pruning and budding knives, farmers' knives, &c., and an assortment of table knives in common and medium grades.

E. H. BARNEY, successor to Barney & Berry, Springfield, Mass., exhibits in a very elegant case a handsome assortment of Barney & Berry's celebrated club, all clamp and rink skates. These goods are shown in all the various styles, blued, silver, gold and nickel-plated, and with plain and chased runners. Beautiful as these goods appear, and they will bear the most critical examination, we think they are fair and honest samples of the well known goods of this house.

Agricultural Hall.

AUBURN MANUFACTURING CO.

At the intersection of center transept and aisle N, in Agricultural Hall, the Auburn Manufacturing Co., of Auburn, N. Y., make one of the most attractive exhibits of their splendid line of hand tools for farm and garden purposes that we have ever seen. Upon a large circular platform they have erected an arched structure of elegant design, surmounted with sample boards showing their tools from every point of view. Among the goods we noticed a fine assortment of steel manure forks; hay and straw forks, both round and oval; spading forks, harley and coke forks, and forks for special purposes; potato hooks, garden rakes, both steel and malleable, &c. They also show a fine assortment of field, socket and shank hoes; handled planters' hoes, weeding hoes for garden and farm use, square eye planters' hoes, &c. They also exhibit a very large variety of edge goods, such as grain and grass scythes, bush or bramble scythes, Western corn knives, hay and straw knives and grass hooks. In wood goods they exhibit grain cradles, Lamson's patent scythe snaths, hand rakes and forks, hoe and rake handles. This display is the largest of its kind in Agricultural Hall, and from its prominent position and the excellent manner in which the goods are shown commands much attention and deserved admiration. In order that visitors may see the goods exactly as they are turned out from the factory, a bundle of each of the specimens shown on the sample boards is also on exhibition, and as nearly 300 different kinds of goods are shown, these make around the platform of their structure quite a wall of glistening steel.

A. J. NELLIS & CO.,

Pittsburgh, Pa., show a large assortment of agricultural steels; Nellis' original harpoon horse hay fork, grapple and pulleys, patent hay conveyers, patent cotton ties, &c.

T. ROWLAND'S SONS,

No. 13 North Fifth street, Philadelphia, show samples of polished and plain shovels, spades and scoops, draining spades, &c. The bright shovels on exhibition are very highly finished. The manufacturers say of their goods: "These are a plain back shovel, being made entirely of first quality cast steel. They are a light, stiff shovel, being far superior to the old style plain back shovels, and, as for strength and durability, there is nothing equal to them in the market. They are particularly adapted to railroad work. These shovels are polished or finished black, as may be wanted."

H. FISHER,

Canton, Ohio, exhibits patent prairie mower knife grinders, a useful invention for sharpening harvester knives, paper cutters, planing machine knives and other edge tools that are difficult to grind on a revolving stone. The apparatus consists of one malleable ironstone holder with wood handles and brass mounting, one sharp cutting stone and two malleable iron vises to hold the sickle. The manufacturers say of this invention, which has been awarded first premiums at Cleveland, Cincinnati and Pittsburgh Expositions: "This labor saving implement, weighing but five pounds, can be taken to the field. No water required, as the apparatus being given a vibrating movement like a file will not heat the section and take the temper out, as a grindstone, emery wheel, or any other revolving body would do, when used dry; it will not glaze. Any boy capable of driving a team can sharpen a mower knife alone, in one-half the time required by two men to do the same work with a grindstone. The labor being light, the farmer will keep sharper knives, and thus save many trips to the machine shop to have knife heels and pitmans repaired, boxes rabbitted, &c. With this apparatus the mower sections can be ground back to the angle, which cannot be done by the old process." Mr. Fisher also exhibits his sickle edge hay knife or saw, which is a heavy cast steel blade 22 inches long, 5 inches wide near the handle and tapering to the point. The cutting edge is serrated the whole length of the blade similar to a reaper section. It is claimed for this knife that it will cut loose or packed hay, straw or fodder faster and with less labor than any other hay knife in the market; he also exhibits Fisher's new farm bell and Fisher's new farm bell telegraph chart, knife sections for mowers and reapers and melting ladles.

WITHINGTON, COOLEY & CO.,

Jackson, Michigan, show a large and handsome assortment of garden and farming tools, embracing socket and solid shank cast steel field hoes, a great variety of garden weeding hoes, cast steel and malleable iron garden rakes, hay and manure forks in a great variety of sizes and styles adapted to home and foreign markets; also spading, mining and other forks for special purposes, cast steel potato and manure hooks, scythe snaths, grain cradles, corn knives, hay knives, etc. The goods of this firm stand deservedly high not only in this country but in England and on the Continent of Europe; they are elegantly finished, and will compare favorably in all respects with any similar assortments that we have seen. Alfred Field & Co., No. 93 Chambers street, New York, U. S., and New Edmund street, Birmingham, England, are sole agents for these goods for Great Britain and the Continent of Europe.

THE AMERICAN SHOVEL COMPANY,

Birmingham, Conn., exhibit an assortment of Birman's patent shovels, scoops and spades.

BROWN, HINMAN & CO.,

Columbus, Ohio, have on exhibition an elegant assortment of their garden and farming tools. In steel goods they show every variety of manure and barley forks, spading forks, hay and straw forks, potato and manure hooks, socket and shank field hoes, cotton hoes, mortar and street hoes, handled planters' hoes, garden rakes, weeding rake and hoe, &c., and a good line of malleable garden rakes. In wood goods they exhibit an assortment of Lamson's patent scythe snaths, grain cradles, &c., handles for forks, hoes and shovels, hand hay rakes, &c. These goods are as well finished as any we have seen, and, indeed, it would be a difficult matter to decide as regards the external appearance of the grand assortment of these tools on exhibition between any of the prominent makers. They are all deserving of great praise, and we believe we are strictly within the bounds of truth when we say that no other country in the world can show such progress and perfection in the styles and manufacture of these necessary implements, a truth that is fully attested by the foreign demand, which for years has existed for these goods, and which steadily increases.

MYERS & ERWEIN,

Philadelphia, exhibit an assortment of hay, manure and spading forks, potato and manure hooks and forks for special purposes.

E. S. LEE & CO.,

Rochester, N. Y., show Waters' Improved tree pruners, an implement which they have taken great pains to perfect, and which has been awarded first premium at a great many State fairs in New York, Massachusetts, Michigan and Ohio, beside a special medal at the American Institute Fair in 1872. These pruners are sold with poles four, six, eight and ten feet long. The manufacturers claim for this invention the following advantages: "The peculiar construction of the hook which encircles the limb, the support of the blade being upon both sides, which is very important, allowing the blade to be made very thin, thereby reducing the resistance of the wood and making an easier and smoother cut than any other device. The knife being connected by a wire rod, the pole may be of any desired length, thus obviating the necessity of a ladder or climbing. The operator cannot fail to see that the same is a decided improvement over all other shears, or pole pruners, worked by rope or cord. The small space required for working the knife allows it to be used among close dense branches, where great difficulty is found in using the old-fashioned shears. For pruning raspberry, blackberry, and rose bushes, the thorns of which are annoying, it has proved peculiarly serviceable. For removing worms' nests and thinning out fruit it is very desirable, and can be used as a fruit picker."

THE BEARDSLEY SCYTHE CO.,

West Winsted, Conn., have on exhibition a handsome assortment of scythes, grass hooks, corn knives, hay knives and bush hooks.

HIRAM, HOLT & CO.,

East Wilton, Me., exhibit their patent "lightning" hay knives in a great many sizes.

SHEBLE & FISHER,

proprietors of Fairmount Fork Works, Philadelphia, show a handsome assortment of cast steel hay, manure, spading, sluice, coke and tanners' forks, rakes, &c.

SMITH & HARPER,

Philadelphia, manufacturers of garden and farming tools, make a nice display of hoes and rakes, garden forks, &c.

MAXWELL, ROWLAND & CO.,

Holmesburg, Philadelphia county, Pa., exhibit a fine assortment of shovels, spades and scoops, which are nearly all extra finished goods. Regarding their cast steel welded plain back shovels and spades, they say: "The blades of these are made from the best quality of cast steel; the straps are welded to the blades. The shovels are smooth back, having a decided advantage over the cast steel back straps, no rivets being in the blade or unevenness in the strap, always working smoother than a riveted back can work. The shovels are lighter, stiffer and stronger than any back strap or steel edge shovels. These shovels are polished or finished black, as may be wanted."

GEORGE GRIFFITHS,

Philadelphia, exhibits an assortment of shovels, spades and scoops with long and D handles, galvanized coal hods and pails, Russia iron, roll pans, &c.

THE EAGLE COMPANY,

Riverton, Conn., show an assortment of scythes, hay knives and grass hooks in good commercial finish.

THE OSBORN MFG. CO.,

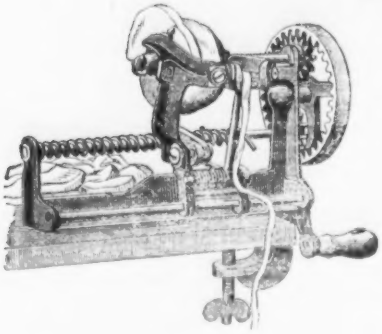
New York, make a magnificent display of bird cages in brass, gold, silver and nickel-plated wire. They also have on exhibition the handsomest aviary that we have ever seen. The dimensions of this beautiful cage are as follows: The base is 58 inches by 89 inches, and from the floor to the top of the dome which surmounts it, is about 7 feet. It is made with nickel-plated pillars, both round and square, running from the base to the top of the main walls, with brass wire between the pillars, and is finished on the top with ground and cut glass about 6 inches in depth, and which extends to the line from which the roof and dome springs. The dome is after the style of the beautiful dome on Horticultural Hall, and the whole cage is modeled much after the plan of that building. The bottom of the cage is elegantly finished in French walnut, and the trays, of which there are quite a number, are removed in drawers provided with handsome drop handles. This company only manufacture the finer class of cages, such as those described above, no Japanese goods of any kind entering into their assortment. They also exhibit a line of squirrel cages, &c.

THE NEW LONDON SCYTHE CO.,

New London, N. H., display a large line of well finished scythes and corn knives.

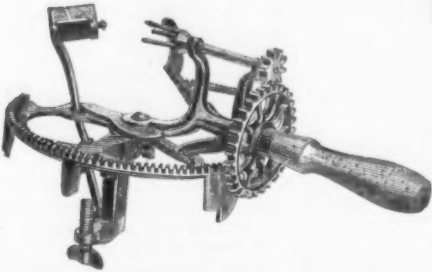
[Continued on page 20.]

Goodell Company's Machines.



THE BAY STATE APPLE PARING AND SLICING MACHINE.

Pares Apples as well and as fast as any Apple Parer made excepting the Lightning Parer, and when you get the apple Pared it is also cored and sliced, all ready for drying or immediate use. The slices are cut in the very best possible shape. A bushel of apples can be easily prepared for drying in 10 to 12 minutes. We also make a MAMMOTH MACHINE! weighing 14 lbs., with habbited boxes and steel arbors for factory use, for which a large demand has already sprung up. There is less waste of fruit when worked with these machines than when done by hand, and one of these machines will do as much work as 20 persons can do by hand.

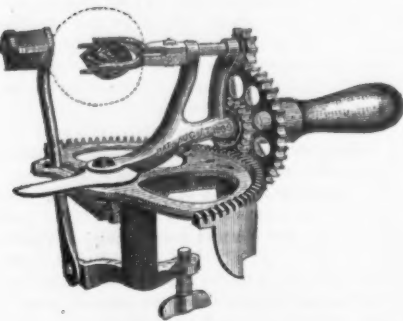


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The Old Reliable Turn Table Apple Parer

is improved so as to loosen the apple on the fork when pared.

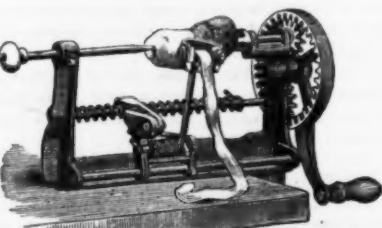


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Has proved itself to be a very valuable implement in Peach-Growing Sections, and is the only practical Peach Parer extant. It is also a first-class Apple Parer.

THE CLIMAX CORER AND SLICER

Is the Fastest, Simplest and Cheapest Slicer made.



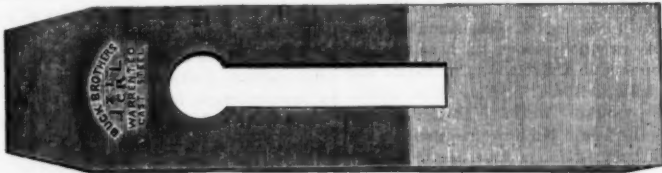
WE HAVE BEEN TOLD

That a good Potato Parer was worth a million of dollars. We have sought for it long and at last it is found! Our orders are pressing us and we are pressing our work, and will supply the demand. So please do not hesitate, but send in your orders.

CHAMPION HOG RINGER
Rings and Holder
Only Double Ring
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The only ring that
will keep HOGS
from rooting. No
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EAGLE BILL CORN HUSKER
Is the best Husker in the
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is the best. Use no other.
Huskers 25c.

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Only Single Ring
that closes on the
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No sharp points in
the nose to keep it
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Quarrying,
COAL,
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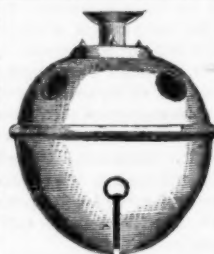
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BLACK DIAMOND STEEL WORKS, Pittsburgh, Pa.
The Hoisting and Conveying Machine suits us; we cannot say too much in its favor.
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Half Cloth.....\$1.00 each.
(Cloth Back and Corners, with Morocco Paper Sides—a good, serviceable Binder.)
Full Cloth.....150 "
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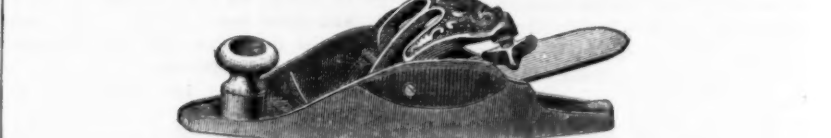
PERFECT COMBUSTION BY AN OXYGEN BLAST.

By this process oxygen is imparted to the blast simultaneously by its passage, on its way to the place of combustion, through a chamber or vessel holding an oxygen compound, from which, by the agitation of the air therein, oxygen is set free and thus imparted to the blast. The required volume of this blast is one-half less. The combustion becomes perfect therefrom, all the carbon in the fuel being converted into a high and concentrated heat, without smoke or gas, but that of carbonic acid, being formed. Beside a saving of fuel, obtainable in all cases by this blast, advantages arise from it varying according to the appliance of the heat. On Forge Fires it gives a clean and intense heat, free from all sulphurous gas, whereby a better and quicker welding is had and time saved. On fires under boilers for making steam, the saving in fuel is 25 per cent, and over, the working capacity can be increased in same ratio by reason of the intensified and accelerated combustion, which latter also overcomes the disadvantages connected with the use of fine dust and impure coal. Castings from a cupola in which the fire is sustained by this blast become of superior quality, uniformly soft to work and very tough, resembling wrought iron and steel; they forge hot and cold to some extent; the iron becomes strengthened and purified, being freed from carbon and sulphur. For blast furnaces this process becomes of vast importance—it saves fuel, increases the working capacity, perfects and reduces the cost of the metal, makes sulphurous and other impure ores fit for use. The serious drawbacks arising from imperfect combustion, caused mainly by otherwise uncontrollable atmospheric influences, are overcome. The work of a puddling furnace and that of decarburizing the iron, both for wrought iron and steel purposes generally, is much simplified, shortened and perfected as to purity of product; the work of so many hours is reduced to as many minutes by this process. The process has the merit of being simple and easily applied, and with but very little expense, and this only for the needed chamber or vessel and its connection with the blast pipe; the vessel may be a wooden keg, barrel or larger cask or tank, properly lined, from two gallons for a single forge fire up to 500 gallons and over, according to the blast in use. The cost of the oxygen is conditioned by, and made subject to, its effect—it is but a small item compared to the gains from it. Although this process has been in practical use for over a year, the inventor felt reluctant to offer it to the public before having its utility and practicability fully established, beyond any and all contingencies, not from a theoretical standpoint, but from the testimony of manufacturers who have used the process this last year, and whose standing and reputation as manufacturers are of the highest order, and such as to entitle them to the consideration of others. For further information, and for small specimens of castings from this process, address

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IRON BLOCK PLANE.

No. 110. 7 1/2 Inches Long, 1 3/4 Inch Cutter, \$9.00 per dozen.



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It is the only Wrench that will hold Gas or Steam Pipe, Gas Burners, Round Iron or Steel without slipping. Samples sent to the trade only, on receipt of fifty cents and business card.

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BUTCHER KNIVES
Made under Wood's Patents, and as our styles are unlike other makers, and Very Handsome, the most Durable made, and exceedingly Low in Price, we invite correspondence concerning them. We make the very best known, with no exception. Their cutting qualities are unequalled, the handles are unequalled, the prices are unequalled. Our APPLE AND KITCHEN KNIVES are made of the very best steel and tempered in the best possible manner, and are cheaper than any others. Try us and let us have a chance to prove the above assertions to be true. Address,
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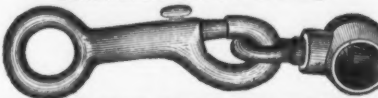
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Sectional View of the Snap.

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THE COVERT'S METALLIC HOLD BACK.

The Mineral Wealth of Southwestern Virginia.

BY C. R. BOYD.*

Without attempting to do more than give a preliminary or skeleton report upon the geology and minerals of Southwestern Virginia at this time, I am led to hope that the great commercial importance of the 60 miles of cross-section here crudely treated of will be apparent to those who have not already rendered themselves familiar with that district. At the adjourned meeting in October next, a fuller and more complete paper will be presented, which, it is hoped, will supply the most minute additional information that may be desired.

This 60 miles length of cross-section is located directly across what may be considered, in lieu of an exact instrumental observation, the central portion of the Appalachian chain in Southwestern Virginia, having its center near Wytheville, Wythe county, Va., on the Atlantic, Mississippi and Ohio Railroad—a main stem running from Norfolk on the seaboard toward Memphis, St. Louis and other Western cities. A remarkably valuable parallel cross-section is situated 35 miles further E. N. E., which would have a center nearly at New River Depot on the same railroad, passing across the same geological strata as the first, with the same extraordinary mineral characteristics in the main. The map and cross-section now on exhibition in the Centennial Committee Rooms of the Mining Engineers, No. 1100 Girard street, Philadelphia, will give a very accurate general idea of the subjects of this paper.

The southwestern end of the cross-section is located in Carroll county, Va. (which lies just south of Wythe county), near the southwestern limit of the gneissic system, marked by the eruption of a six foot vein of trap, holding particles of native copper, which, occasionally, along the 20 miles length I have examined, presents interesting features, but requires a closer and much more critical inspection than I had time to give it in order to determine an approximate idea of its commercial value, my time being consumed in that vicinity by an inspection of the more interesting pyritic lode which lies but a short distance north of it. This pyritic lode is marked by extraordinary quantities of limonite, varying between 20 and 40 feet in depth by a width of from 60 to 150 feet, in many parts holding, according to Dr. F. A. Genth, about 50 per cent. of metallic iron. It was first ascertained to be the mere outcrop or iron cap of a pyritic lode holding copper, by the precipitation of that metal on the iron and steel of the tools with which it was first mined for forge and foundry purposes, and, finally, when a few feet depth had been reached, by showing the green crystals of the carbonate of copper. Under the iron cap, marked in its lower part by carbonate of copper, which varies in quantity from one point to another, suggesting the idea that the vein alternates in richer and poorer copper ores, there is, as usual in such veins, a bed of the black oxide of copper, accompanied by copper glance, the vertical thickness of which, observed at two points, is, respectively, two feet and three feet, giving, as to its best ore, 51.53 per cent. metallic copper by Dr. Genth's analysis, and 21.08 per cent. as to its poorer average. Next below are the pyrrhotite and copper pyrites, accompanied by actinolite and chlorites, and calc-spar in small quantities. The copper pyrites yield, according to the same analyst, from a strictly poor average, 1.70 per cent. of metallic copper, and 9.36 per cent. from another average, leaving no doubt of the great economical value of the lode at a point on Chestnut Creek in Carroll county, where I had the best opportunity to examine it. Here the lode has a thickness varying between 45 and over 100 feet, inclosed in talcose and micaceous slates and schists, traceable, to my knowledge, through the county of Grayson, Va., and Ashe, Alleghany and Watauga counties in North Carolina, and to the northeast into the county of Floyd, Virginia, and reported further on.

In the same series of rocks may be included the Ore Knob Copper Company's mine, the Peach Bottom copper mine, with its silver bearing galenite, and the Elk Knob copper lode, of Western North Carolina, as well as the bands of magnetic and specular ores, and the veins of mica, feldspar and quartz so largely developed in that part of North Carolina. These last, copper and other veins, have been pretty fully explicated by Dr. T. S. Hunt, Prof. Kerr, Dr. Genth and others.

Leaving the great copper lode of Carroll county, with its accompanying stettite rocks, some ledges of which are pure enough for furnace lining, we take up our cross-section line to the N. N. W. again, through chlorite slates and kindred rocks of the Huronian period, synchronous with the Langmynd group, having a dip S. E. and S. S. E., varying between 45° and 90° from the horizon, we traverse about five miles of a repetition of these strata to where we strike the main ridge of the Unaka, or Iron Mountain range, projected northeast from Western North Carolina, Georgia and Alabama, and likely to give us those valuable measures of metallic veins by which it is characterized at other points further south, with some valuable additions as to our cross-section. At this point, we might say, or near it, the New River breaks through on its way toward the Kanawha, dis-

*Read at the June meeting of the American Institute of Mining Engineers.

† It will be a matter of some interest to geologists visiting that section to examine the great granite mountains in Grayson county, Va., known as Point Lookout and Buck Mountain. They have the appearance in places of an entire want of stratification, strongly suggesting the idea that they belong to a much older series of rocks than those around them. It may be determined that in the projection of the sides of these ancient rocks those planes of least resistance were found that resulted in the great fissures, during the disturbance of the earth's crust, into which have been interjected some of those metalliciferous lodes which I have attempted to describe. There is quite a similarity between the section and Cornwall, agreeably with some published accounts I have read, although they do not appear to be synchronous.

charging about 1500 cubic feet per second in usually low stages. This Unaka, or Iron Mountain, along here marks the division, so far as observed, between the Huronian and Cambrian periods. In places along it, it is much disturbed, sometimes presenting the appearance of a much disturbed anticlinal, but generally having a dip to the southeast varying between 45° and higher; having a hard conglomerate near its center, and in its northwestern flank stratified veins of brown iron ore, the measured thickness of which at one point shows 6 feet and 9 feet for two of them, between head and foot walls of slate, which I place nearly about the junction of the Potsdam and calciferous sub-epochs, judging from the proximity of known rocks, for no organic remains have as yet been visible to me at the point. From these veins and others carrying manganese, immediately near, I conclude the immense beds of sedimentary ore of great purity in Wythe and Pulaski counties are derived in part. An analysis of these ores has been so frequently made, and they have been tested practically so often by a few iron men of the section, without finding any objectionable impurities, except as to ores from two or three isolated places, that I will postpone giving full analyses, and will add that the very curious may obtain valuable information as to minor constituents by referring to Messrs. Booth & Garrett, chemists, and to Prof. Fessenden, who have become very thoroughly acquainted with the iron ores of the New River region. I will say that in eight specimens taken from different points on New River, some from these mammoth beds, submitted to these gentlemen, they found an average of 53.68 per cent. of metallic iron and 0.141 per cent. of phosphorus, the highest phosphorus being 0.23 per cent. From these specimens, a magnetic oxide gave an average of 65.062 per cent. metallic iron, with 0.11 per cent. of phosphorus; two of the fragments giving no phosphorus at all. Three specimens of red hematite gave an average, by those chemists, of 65.90 per cent. of metallic iron, and 0.033 per cent. of phosphorus. It should be borne in mind that these specimens were taken from points on New River and near it, all the way from Grayson, where the river comes in from North Carolina, down to Peters Mountain in Giles county, Va., where it breaks through that mountain on its way toward Hinton on the Chesapeake and Ohio Railroad, and on to the Kanawha.

To revert to our cross-section line again: leaving the Unaka, or Iron Mountain, and going our old course N. N. W., we fall into the southeastern border of what would be the great valley of Virginia prolonged, across which the New River cuts irregularly to the northeast, and having near it on each side much of the great sedimentary iron ore, we have in the center, considering the dip, a mile or so of the Unaka into limestones, both magnesian and non-magnesian, generally crystalline and void of organic life, having a strike generally N. N. E., and a dip, which, for want of a better word, may be called heteroclinal, for the rocks are chopped about a great deal in places. In this series of rocks on the bank of New River we are at a 40 foot vein of lead and zinc, traceable for many miles E. N. E. and S. S. W., generally perpendicular in attitude, and just at this point owned and operated by the Wythe Lead and Zinc Mining Co., sometimes known as the Union lead mines and the Austin mines. The ores are sulphurets and carbonates of lead and zinc blende and carbonates of zinc, principally in a generally pure condition. This particular mine has been worked since some time previous to 1776, furnishing some of the lead used by the Continental armies, and a great part of that consumed by the Confederates east of the Mississippi in the late war. But, after the evident great amount of ore has been removed, no mining has been done below water level. Over 10,000 tons of the zinc carbonates have been shipped North and converted into oxides, etc., since 1866. Following this great lode northeast or southwest on its course, you do not find it so well in hand as at the Wythe lead and zinc mines; at points it is thrust up in separate veins. A much closer inspection at several promising points may reveal it united to such an extent on the surface as to render it profitable mining; notably, two or three points west of New River, and another near Reed Island Creek, on the left of Graham and McDowell counties, where there is evidently a junction of it with a lode of pyrites of iron, of which I shall speak presently, and another point or two in Pulaski county, following down the course of New River in that part. These remarks above are as to the surface. There is great probability that deep mining will find many of these minor veins united into one of sufficient size to be of great commercial value as it is at the Wythe lead and zinc mines.

Leaving the lead vein, and crossing New River on the line of our cross-section again, we pass over a narrow belt of lower limestone, through occasional beds of neutral brown hematite which line this valley for miles in each direction, we strike another belt of crystalline limestone, in which there is a lode of iron pyrites, not running in one regular line through the country, but frequently broken and thrown off a regular course, 12 feet thick at the point I could obtain the best measure of it, and decomposed almost entirely in all the hills through which it passes, leaving an extent of nearly one mile on the left, through the county of Wythe on Cripple Creek and near the New River that I have never attempted to measure. Near this lode, just west of where our cross-section passes, are very considerable deposits of manganese oxide, without any chance as yet to obtain accurate measurements, which, by the tests of Professor Cooke, of New Jersey, gave the following analysis: Weighted oxide of manganese, 76.6; black oxide of manganese, 66.98; of which there was available oxygen, 13.33; and metallic manganese, 57.21; iron, 0.65.

This ore was once analyzed specially for impurities, and no appreciable quantity was found in surface fragments. It should be tested at some depth below the surface. Near to this, to the north of it, is a measure of manganeseiferous iron ore 4 feet thick I can vouch for, and more that I could not obtain for want of developments; and to the south of this there is still another vein in the north flank of the Iron or Unaka Mountain that will be soon investigated.

Leaving our pyrites lode and its surroundings, we pass N. N. W. again, over an interval of about two miles, on our cross-section, of limestones, red slates, etc., holding here and there brown hematites and manganeseiferous deposits, and arrive at the Lick Mountain, an intrusion of Potsdam sandstones and overlying and underlying strata, synchronous with the steeper underlies in the shape of a disturbed anticlinal for a part of it, and a succession of ridges for another part—an island of such, as it were, in the heart of Wythe county, giving way on every side to a limestone valley, in which, I think, may be traced such rocks as Professor Emmons denominates Taconic. This I judge from similarity of description, and not from character of organic life, as I have found too little as yet to justify me in naming of strata on that score. In the southern escarpment of this Lick Mountain is a stratification of slaty brown iron ore more than 150 feet thick (I did not follow its width further), containing about 35 per cent. of metallic iron, at least as to surface fragments, from which, no doubt, a great part of the iron in the ores of the valley is derived, being very elevated and much exposed to the action of the elements. One mile further to the north in this mountain is a vein of manganese ore, apparent-

ly binoxide, crystalline in part and very dense, the thickness of which I could not obtain, as the gentleman to whom the land belongs is just now about having the necessary developments made.

Following these strata either way you will find extraordinary surface quantities of both manganese ores and manganeseiferous iron ores. At one point, four miles south of the Atlantic, Mississippi and Ohio Railroad, called the Glades, in Wythe county, a shaft has been sunk into a deposit of manganeseiferous iron ore of irregular measures over 4 feet, having cavities in which bang stalactites of manganese oxide.

To revert again: near to our cross-section line on the Lick Mountain, and near the Potsdam sandstones that compose the heart of the mountain, is a measure of fire brick clay, which I traced in the bed of a small stream more than 100 feet diagonally across it, not finding either wall of it; a specimen of which, with many of different ores from this region, is on exhibition with the Smithsonian Institution collection at the United States Centennial Building, as well as with the Virginia Mineral Bureau exhibit, and in a private collection of the New River Railroad Company at T. S. Main Building.

In the Cripple Creek Valley, Wythe county, there is a stratum of extremely hard conglomerate, reported 15 feet thick, by many hundreds of feet in length, called corundum by those who have just begun to mine it, which I will take great pleasure in examining and reporting at a future meeting. Its only recommendation to my notice, so far, is the fact that a gentleman of that section allowed some of it to be ground in one of his mills on a pair of stones selected for their grit. The faces of the stones were soon as smooth as possible. While the piece shown looked well enough, I can give it no importance until it is investigated further.

The northern or northwestern face of Lick Mountain, immediately facing the town of Wytheville, is a repetition in great part of the southern escarpment; only that the ores do not appear on the same gigantic scale. But it has its manganeseiferous iron ores, red and brown iron ores, fire clay, manganese ores, and a thin stratum of slates giving traces of copper, near the northern base of the mountain. That part of our cross-section about the Atlantic, Mississippi and Ohio Railroad, transverse of it, that is either W. N. E. and S. S. W., will prove an interesting one to the curious. Beginning 30 miles to W. S. W. in Smyth county, there are developments of barytes, the product of the mines having been for a while shipped north. Following the line of the railroad eastward from the barytes, we find flatter surface indications of specular iron ores, and further on toward our cross-section line of copper ores. But these ores have evidently been left by some glacial action, as well as those copper ores which appear in such flattering quantities on the surface near Max Meadows Depot on the Atlantic, Mississippi and Ohio Railroad, 8 miles east of Wytheville. By an analysis which I had made in Baltimore, there was 9.8 per cent. of metallic copper in ore found near Max Meadows. If it should be the surface outcrop of a sulphureted copper vein beneath, it is very close to railway transportation, leading by one road to the seaboard 300 miles distant. Following our transverse section 5 miles further eastward into the Peak Mountain on the Atlantic, Mississippi and Ohio Railroad, we have the outcroppings of a true anthracite coal, at the surface showing all the indications of a crushed vein, with a measure that was difficult to obtain when I was there, but it may be placed at a little less than 3 feet, although it appears larger. It is a sub-carboniferous coal, about here including quite an area of nearly flat dips, but presenting an appearance suggestive of faults and fissures. It deserves a very strict and close survey to determine its probable value.

Going back to Wytheville, and pushing northwest across the Trenton and calciferous limestones and sandstones two miles, we come to a vein of red hematite of a magnetic character 9 feet thick, perpendicular in attitude, in limestone and flint, showing surface indications each way half a mile, at intervals, which has been tried by the Tredegar Iron Works, of Richmond, Va. Passing on N. N. W. three and one-half miles further on our cross-section line, we go over a great fault in the crust of the earth, and suddenly find the sandstones of the sub-carboniferous and slates beneath them holding eleven seams of coal varying in thickness between 3½ feet and a few inches. These veins have a general dip S. S. E. of about 35°, the coal containing enough bitumen to make a good coke at this point, and burning well in grates and stoves. It has never been remarked that any of this coal ever decrepitate in the fire. Still, as the measures have been subjected to quite different degrees of disturbance at different points, elements may have been intersected or percolated through at some points that would cause decrepitation of those coals.

Accompanying these veins above in the order of stratification is an 18 inch vein of black-band, having its outcrop a hydrated peroxide of iron, sometimes in hollow casts and nodes. These veins, as you go eastward along the southeastern escarpment of Little Walkers Mountain, in which they occur, become more of an anthracite until you reach the Peak Creek Hills, and there you find the coal an anthracite as described above. Further eastward, in Pulaski county, it is nearly an anthracite in the southern face of Cloyd's Mountain. Following still further eastward into Montgomery county, crossing New River, the same veins are now mined very extensively for that section, having pretty regular measures from 4 to 7 feet in thickness and less, nearly all pure coal—still with its rather high angle of inclination, S. S. E.

Going back to our cross-section line at the coal, about five miles in a straight line N. N. W. of Wytheville, leaving the great valley behind us, we strike into an alternation of lower and higher mountains. The lower mountains are composed in the central part of Catskill sandstones, underlain by tolerably easily recognized gradations down to the Marcellus and Hamilton slates and shales, with those strata such as the Corniferous, Oriskany, Lower Helderberg either left out or but feebly represented until you reach the Niagara epoch, generally with a strike E. N. E. and dip S. E. 35° to 40°. In going N. N. W. from the outcrop of the Catskill, on the crest of the lesser mountain, we pass across the upturned edges of the lower strata, descending into a valley that is composed mainly of Marcellus, Hamilton and Genesee beds, and having a poor soil; we then begin to rise the greater mountain, passing through all or nearly all the Niagara sub-epochs until we reach the crest of the higher mountain, which is generally composed of the Utica, or Clinton, or the Oneida sandstone. After passing this you begin to descend very rapidly into a rich valley, passing through the Hudson shales and limestones, and generally going on down into the calciferous, before that great fault occurs again which brings you face to face so suddenly with the sub-carboniferous sandstones. These mountains are generally monoclinal, with the exception of one great anticlinal of which I will speak presently. The conditions above described may be the better understood by placing the two hands side by side horizontally, supposing them to hold all the strata from the calciferous up to the sub-carboniferous inclusive. Point the hands toward the E. N. E. to get the direction of our mountain; imagine a wave motion to exist across many hands so placed, and press all together, sliding the right hand upon the left; you have the calciferous riding up on the

sub-carboniferous, with the lines between the hands representing the great faults; and if you will then consider that the elements have acted so much more rapidly on the soft Marcellus and Hamilton shales, upturned at a high angle, you will find an explanation for the poor valleys.

This operation has been repeated across this section, or near it, four times, with the exception of a curved anticlinal in the case of the Round Mountain, in Bland county, Va., and about six times between Peak Mountain and the sub-carboniferous measures in Tazewell county, in the southeastern edge of the Great Kanawha coal basin proper, giving us quite a succession of nearly parallel ridges. In the southeastern escarpments of the greater mountains, and doubly in the curved anticlinal of the Round Mountain, we have the ores of the Medina and the Clinton epochs, giving in the long lapse of time since they were thrown up beds of both iron and manganese ores of great value. The manganese ores are derived from two sources, a stratum of silica and manganese oxide combined, nearly about the junction of the Oneida and Medina (but the exact location I will determine by future observations), and a stratum of an oxide that underlies it. The iron ore, the red hematite usually, is a reduction from small flattened grains and petrifications of specular red hematite in shells of the Clinton, which, in fact, at points is left out. Still, the Clinton has a large development at short intervals, always making the mountain much thicker where it occurs; not only giving a very respectable stratum of ore of the small flattened grains, but also, in places, the most beautiful petrifications of a perfect shell (*Atrypa Reticularis*, apparently) in specular red hematite, as is the case on the southeastern escarpment of Peters or East River Mountain, in Giles county, Va.

In this county, Giles, on the parallel section spoken of in the beginning of this paper, there are extraordinary developments of iron and manganese ores, notably the Sinking Creek veins and deposits, which I will not fatigue you further by giving the measures and analyses of; but neither are objectionable. The red hematite ores, partially magnetic, are at Chapman's and Pack's, on New River, 5 feet thick, inclosed, as to a portion of them, by brown ores, and showing by analysis of Messrs. Booth and Garrett, 64.96 per cent. metallic iron and 0.50 per cent. phosphorus. This vein has been traced by me at intervals for 12 miles. It shows plainly at low water, crossing New River, very clearly defined in the bottom of the stream. On the Angel's Rest Mountain and the opposite mountain across New River, are remarkable surface quantities of ores, together with very well defined deposits of veins in the sandstones, varying from a few inches to many feet, the measures of which I will be pleased to give in a future paper, as well as those of Peters Mountain.

Taking up our cross-section line again, and following it N. N. W., over the crest of the last high mountain to a point about 25 miles in an air-line from Wytheville, and pursuing our course 10 miles further, we pass across the remarkably fertile country of Tazewell, Va., 8 miles in an air-line across the Bluestone and Abbe valleys, and strike about the terminus of the cross-section into the southeastern edge of the Great Kanawha coal field proper, which here has a gentle dip inclining to the N. W., the measures aggregating here about 46 feet of coal—one vein being 11 feet with one foot of slate, and another exactly four feet. But these measures are so nearly the same in character as the upper New River series, spoken of in the words of Mr. M. F. Maury, Jr., State Geologist for West Virginia, that I refer you to his admirable papers.

I have not said anything of the valuable salt and gypsum basin, 30 miles west of our cross-section line. It is hardly necessary. Mr. Leslie, in his thorough report to the Shenandoah Valley Railroad, has pretty thoroughly explained that. I will reiterate a well known fact with regard to the gypsum, namely, that it is 800 feet thick in the Holston Valley at one point, supposed to have resulted from water charged with sulphurous oxides taken from decomposing pyrites in the bordering rocks, coming in contact with the lime carbonates and the former radical so replacing the carbonic acid. There are other versions equally plausible.

There are ample quantities of charcoal timber in the region we have had under consideration to last until far into the time when stone-coal and coke can be had from Kanawha. If furnaces in our section, or those contemplating it as the scene of their future operations, would avail themselves of the facts as set forth in the paper of Mr. L. Lowthian Bell, lately read before this Institute, there can be no doubt, with the kindling ores in which this district abounds, that a maximum production of an excellent quality of gray pig can be secured at a minimum cost, allowing a very fair margin in even these times, and, too, over lines of transportation that are considered now to be costly to the shipper. Prof. Newberry says: "Charcoal may, however, be produced here in abundance for many years, and the excellent bituminous coals of East Tennessee and West Virginia will be within easy reach. We may expect, therefore, that this will in the future become one of the most important centers of iron production in the United States." May not the same be said with equal truth of the great copper lodes, and the lead and zinc lodes? One of these I have not described, lying in Bland, with an extension into Giles county, but not having developments sufficient for measures to be taken; and still another just below the Peters or East River Mountain near New River.

Of the mineral springs for which this region has been famed, I have so far said nothing. But where there are sulphureted strata which contain other valuable medicinal minerals, it may be inferred that there would be a great many springs of the highest efficiency as medicinal agents. The veins of variegated marble, of lithographic stone, and of corundum will not be forgotten in a future paper.

I hope the mining engineer and the scientist will hereafter visit this really interesting locality more frequently. I know that I but express the real, heartfelt sentiment of the majority of the people of Virginia, when I extend to the guests and members of this Institute a cordial invitation to come and make themselves familiar with her boundless mineral resources. Though the Virginia people have principally been reared to agricultural pursuit, I have never seen those of my section fail to extend all the facilities in their power to those who earnestly desire to develop her material wealth, whatever quarter they might come from. Could we but have the advantage there of the intelligent labor of men like our host of the Philadelphia and Reading Railroad, how short would be the time until our section would team with the life and the activities that we saw along the route of our late excursion!

Progress in Japan.—We are informed that energetic measures are being adopted by the government of Japan, for introducing the improved manufacture of iron into that country. With this view, two charcoal blast furnaces and other works are in course of erection, and it is expected that, by the close of the present year, twelve puddling and seven reheating furnaces, forge train, plate, rail and bar guide mills, with steam hammers, four different shears, saws, lathes, cranes and all other necessary appliances of the most modern construction will be in operation.

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The Iron Industries of Russia.

A correspondent of the *Ironmonger* communicates an interesting account of the present condition of the iron industries of Russia, from which we condense the following:

Owing to the constantly increasing demand in Russia for iron of every description since the rapid extension of her railways, Russia alone is unable to supply that demand, and hence the importation of the foreign article is yearly increasing. Under these circumstances great exertions are being made in order to increase the means of production at home. With this object, a few years ago were established "The Society for Promoting Russian Commerce and Industry" and "The Technical Society," who have now both several hundred members and numerous correspondents in various parts of the empire. These associations have their periodical meetings, when, among other things, matters are discussed in connection with the all important question raised by Russian protectionists of becoming independent of the foreign supply of iron in every shape, machinery, &c. It was the Technical Society who, a short time ago, called together a meeting of the principal iron-masters and machinery constructors of Russia, with a view of deciding upon the best means for promoting the iron industry in all its branches, and the resolutions carried on the conclusion of the deliberations point to a desire for high protective duties on foreign productions. The meeting was held under the auspices of the Grand Duke Constantine, who acted as president on the occasion. The above societies have also established at St. Petersburg a Museum of Applied Science, and at Moscow a Polytechnic Museum, and no pains have been spared to render the same most complete, especially as regards technology in connection with the manufacture of metals.

The principal iron works and mines in Russia are situated in the districts of the Ural Mountains, which extend over a distance of 1000 miles from north to south, separating European Russia from Siberia. It should be observed that many of those establishments are the result of the enterprise of the Russian government, great sacrifices having been made to sustain them. They are, therefore, called government mines or works, as the case may be, in contradistinction to the private establishments owned by private individuals or companies.

There are also government establishments in the north of Russia proper, in the province of Olonets, and in the south in the province of Ekaterinoslaf. Poland contains also some government iron works. After the private works of the Ural follow the establishments in the provinces of the interior—Kaloouza, Toula, Riazan, Vladimir, Kostroma, Nijegorod, Pensa and Orel; the western provinces of Vilne, Kovno, Minsk, Mohilev, Volinsk, and lastly there are a great number of private works in Poland and Finland. In the south of Russia, in the government of Ekaterinoslaf, the manufacture of iron as a private undertaking has only just commenced.

The iron trade of Russia presents a striking contrast to the other branches of manufacturing industry adopted from Western Europe. The government works may be regarded in most instances as failures, in an economical point of view, nor has private enterprise received that development which might have been expected in a country so rich in mineral wealth as Russia, and where labor is cheap. Several reasons are assigned for this state of things, among which may be mentioned the high price of wood fuel, owing to the destruction of the forests in the mining districts, and the absence of adequate means of communication both in the Ural itself and with the markets of the interior. Nevertheless, at the late exhibitions held at St. Petersburg and Moscow a marked improvement was observed in some of the branches of the iron trade. But it is evident that while Russia still continues the expensive process of smelting and working iron with wood fuel it would be useless to expect any considerable increase in the production, although it would appear she has still a large supply of wood fuel in the vicinity of some of her mines. In the government of Olonets, and in Finland in particular, as was demonstrated at the Moscow Polytechnic Exhibition, iron smelting with charcoal is still a profitable business, which is increasing, and will very likely continue to do so for some time to come, owing to the proximity of these provinces to the capital, where the iron trade has lately received a great impetus.

The following are the returns for 1874 of the government works in the Ural, the district of Olonets, the western and eastern mining districts of Poland, and in the south of Russia, showing a very miscellaneous production, viz., cast iron, 202,501 tons; wrought iron, 89,944 tons; steel, 1151 tons; iron castings, 118 tons; projectiles, 8303 tons; steel cannon, 146 tons; cast iron guns, 241 tons; sundry articles in iron, 1065 tons; armor plates, 169 tons; locomotives, 177 tons; steam vessels, 121 tons; swords and bayonets, 46,695 pieces; scythes, 30,000 pieces; rifle barrels, 5725 pieces; percussion tubes, 577,401; and miscellaneous articles of the value of £4000. The production of the private works in 1874 was approximately as follows: In the Ural, cast iron, 227,419 tons; wrought iron, 164,164 tons; steel, 1121 tons. In Central Russia, cast iron, 54,090 tons; wrought iron, 29,596 tons. South Russia, cast iron, 7062 tons; wrought iron, 7121 tons. In Poland, cast iron, 22,155 tons; wrought iron, 13,064 tons. In various other parts of the empire, cast iron, 1270 tons; wrought iron, 6194 tons; steel, 4193 tons.

The yearly production of cast iron for the whole of Russia has for a long time fluctuated between 305,500 tons and 322,600 tons, out of which is manufactured from 210,000 to 221,000 tons of wrought iron. Nearly two-thirds of the whole of this quantity is obtained from the

Ural Mountains. Notwithstanding that both Western and Eastern Siberia possess rich iron mines, the manufacture of iron is so little developed there that the production is insufficient to supply the demand, and considerable quantities of Ural iron are yearly exported to that part of the country.

The most decisive means for increasing the production of iron in the Ural would naturally be the introduction of mineral fuel in its manufacture, which abounds in some parts of the Ural, and requires only to be properly worked, by connecting the coal beds with the principal centers of the iron industry by a system of railways. The latter plan has been decided upon by the government, and the lines are already being laid down. As to iron ore, the store of magnetic ironstone in the Ural may be said to be almost inexhaustible. Take, for instance, the Gorobladgodat mining district: Here a secondary branch of the Ural, the Blagodat (Divine Grace) Mountain, forms one of the most remarkable parts of that chain of rocks, richer in interesting phenomena than any other to be found in Europe. A layer of lodestone covers its eastern side, 280 feet in thickness, for an extent of a mile and a half, and appears to descend, to what depth is unknown, below the level of the surrounding plain. The working of the mine is extremely easy: the ore found at the surface may be obtained with the simplest instrument, and even at a considerable depth, where the ore is more compact, it can be extracted with comparatively little difficulty. Twenty-six thousand tons of ore are annually obtained. The smelting is performed in five different establishments in the neighborhood. The yield of ore from 1813 to 1873 was 1,290,322 tons.

It requires only enterprise and capital judiciously applied in order to bring about a most extensive production of coal in Russia, the deposits being abundant. The Moscow Polytechnic Exhibition showed that a beginning has already been made in that direction, although the results have as yet been comparatively unimportant. Among the establishments which have commenced the smelting of iron with mineral fuel may be mentioned the Bankof Works, in the western mining district of Poland, which produces 2200 tons of pig iron yearly, and the Lisschansk Works, in the South of Russia, in the province of Ekaterinoslaf. The latter establishment, which belongs to the government, began operations in 1866, with the view of encouraging private enterprise in the Danets coal basin in the South of Russia. Since then two private establishments have followed the example of the government—the New Russia Company, in the province of Ekaterinoslaf, and Mr. Pastoukhof, in the country of the Don Cossacks, where blast furnaces have been erected, the native coal being the only fuel employed in the manufacture of the iron. For converting cast into wrought iron, coal is used to a small extent in some of the works of the western mining district of Poland, at the government works of Kamkowsky, in the province of Viatka, and in the government establishment of Lougan, in the province of Ekaterinoslaf. Beside, coal is used for puddling at the Alexandrofsky Works of Messrs. Vsevolof-ky, and at the Kazelsky Works of Mr. Lazaref, in the Ural. As regards the technical improvements in the manufacture of iron, Russia may be said to be just emerging from that state of stagnation which has so long characterized it. In the various productions shown at the Moscow Polytechnic Exhibition, a marked improvement was observed, both in the quality and the mode of manufacture. Among these improvements may be mentioned the introduction in many works of Siemens' puddling furnaces. Generally speaking, iron of such large dimensions as, for instance, boiler plates, blooms weighing 139 poods (2 tons 4 cwt.), armor plates 15 inches thick, weighing 1307 poods (21 tons), were unknown at former exhibitions. The manufacture of rails, considering the great demand there is for them in Russia, is, comparatively speaking, inconsiderable; yet progress is being made in that direction also.

The largest establishment in Russia for the manufacture of rails is that of Mr. Pontilof, in the vicinity of St. Petersburg, where, beside rails, are manufactured rail fastenings, turntables, iron bridges, &c. The works turn out about 1,600,000 poods (25,800 tons) of rails yearly, and about 200,000 poods (3226 tons) of miscellaneous articles of the value of about 3,500,000 roubles (£525,000). In the manufacture English coal is used, and the number of workmen employed is 2000. The raw material is obtained chiefly from England—about 1,200,000 poods (19,355 tons) of wrought iron and 700,000 poods (11,100 tons) of cast iron; beside, 400,000 poods (6000 tons) of old rails are used up from Russian lines. There are works producing rails on a smaller scale in the Ural, the government of Nijni, and in the South of Russia. Among the extensive producers of iron we may mention the English Vicksounsky Iron Works Company (limited). These works embrace as many as ten separate establishments, eight of which are situated in the Ardalof district of the government of Nijni-Novgorod, one in the Melenkofsky district in the government of Vladimir, and one in the Elotomsky district of the government of Tambouf. At these various mines and works iron smelting is conducted, and the manufacture of bar and sheet iron, boiler plates, iron wire, &c. The yearly production is stated to average 50,000 poods (800 tons) of manufactured iron, of the value of 875,000 roubles (£131,250). The number of workmen employed is 3000. The ore, to the extent of 1,200,000 poods (19,355 tons) yearly, is all obtained on the estates of the company.

The largest iron-master in Russia is Mr. Paul Demidoff. The town of Nijni-Novgorod, in the Ural, is owned entirely by him, and it is here that is concentrated the chief administration of

his 13 extensive mines and works, which are scattered along a distance of over 75 miles, embracing an area of about 1,455,000 acres. On these estates, beside iron, are found manganese, copper, lead, gold, platinum, and even diamonds have been discovered. The chief production in iron is bar iron, boiler plates, sheets, rails and a small quantity of steel, amounting yearly to 21,700 tons. The number of workmen connected with Mr. Demidoff's various establishments is 11,000. The yearly value of the iron manufactured, together with copper and other metals, is £525,000.

The manufacture of steel in Russia is progressing, especially the production of crucible steel used for the manufacture of steel cannon, which latter industry is making rapid strides, and has been brought to the highest state of perfection by the government Perm Works, and the Oboukhof Works, near St. Petersburg, attached to the Ministry of Marine. Experiments are constantly being made as to the quality of the metal by testing the guns with powder and shot. The Bessemer process has as yet been adopted only in a few establishments. Mr. Pontilof, mentioned above, may be said to be the first who adopted that process of manufacturing steel in Russia, and latterly the Oboukhof Works have likewise introduced the Bessemer system, as have Mr. Demidoff at his Nijetagle Works and Mr. Bernadaki at his Pernoff Works, in the government of Nijni. A Siemens-Martin steel smelting furnace is also among the late additions to these works. Mr. Bernadaki also manufactures steel on the Martin system at his Somovsky Works, near Nijni-Novgorod.

The chief mart for the sale of iron in Russia is the fair at Nijni-Novgorod, to which we alluded in a former article. It is of immense importance to the iron trade. The Uralian Iron Works, being placed on rivers which enter the Volga system, necessarily find the fair of Nijni-Novgorod a convenient market for the sale of their productions. Beside Uralian iron, to the fair is brought iron from the works in the governments Vladimir and Nijegorod. Although the quantity of the same in comparison with that of the Ural is small, nevertheless there are parcels sometimes of the value of \$450,000. The relatively small imports of iron from those works of the interior, although situated so near to the fair of Nijni-Novgorod, is owing to the goods being sold chiefly at the place of production. The quantity of Uralian iron brought to the fair reaches from 80,000 to 120,000 tons. It is carried in small flat-bottomed open vessels. The caravans, as they are called, with iron, are floated down the rivers Tchousova, Belaya, Kama and Volga. This mode of conveyance is exceedingly risky, owing to the Tchousova not always being navigable, so that every year a score or so of barges are stranded or lost. The iron brought to the fair is sold to the wholesale dealers or into "first hands," and then to other large dealers or middlemen, who sell it to the small buyers, so that before it reaches the consumer it has increased in price to the extent of \$45 per ton. The price of wrought iron depends on a variety of causes. The high price of Russian iron in general is attributed to the unfavorable geographical position of the Uralian Works. The want of proper means of communication makes the iron industry entirely dependent upon nature. For instance, a bad harvest in the government of Perm, from whence the works draw their supply of flour, &c., often produces the most distressing consequences. The distance of the works from the inhabited localities compels the manufacturer to make a year's provision of articles of consumption for his workmen, while the prices of the same are continually fluctuating; should the prices go down in the market the manufacturer is bound to lower the price to the men, although he may have paid dearer himself. From the fair the iron is carried to the neighboring governments and to the capitals. It reaches also Riga, where it comes into competition with the foreign article; this competition, however, is rendered difficult, owing to the great distance, which increases the cost of carriage. Beside, this article goes to Kief, from which place it finds its way to Odessa, where it again comes into competition with foreign iron. The governments of the southeast of Russia do not draw their supplies of wrought iron at all from the Nijni-Novgorod fair, but are supplied direct from the works of the governments of Tambouf, Riazan, Vladimir and Kalouga. The governments situated lower down, to the south of Nijni-Novgorod obtain their iron from Laishef, in the province of Kazan, where the Siberian caravans stop a short time on their way to the Nijni-Novgorod fair. There is very little Russian iron shipped direct abroad from this market.

Centennial Notes.

A. B. FARQUHAR, York, Pa., whose display is said to be the largest and most varied in Agricultural Hall, includes pretty much every kind of agricultural implement of latest designs and with all the latest improvements. Our space will only permit a slight reference to the exhibits, and the first we will name is a six horse-power engine, which is set a little to one side, and low on the boiler, allowing the steam dome to be put forward, and not coming over the crown sheet; while by using side bed plate, instead of box bed plate, there is a saving of 400 lbs. of metal. The valve is set at an angle of 45°, giving all the advantages of valve on top of cylinder, and admits of a direct connection with eccentric. The boiler is very large in proportion to the size of engine, and the feed water is thoroughly heated before going into the boiler. A vertical tubular boiler is also shown, for which economy in room and price are special features claimed. Farquhar's separator is another exhibit. The Uralian Works only send wrought iron to the fair; pig iron will not bear the freight.

other prominent exhibit. It runs with one belt, no gearing, rakes or webs, and threshes, separates, cleans and bags ready for market. The cylinder and concaves are made of wrought iron, and the teeth of Swedish iron, fastened in by screws and nuts; the side plates and all parts liable to wear are iron. The shafts and pinions are steel. The boxes are genuine anti-friction metal and self-oiling. All Farquhar's threshing machines have belt pulleys on both sides, and can be transferred from geared to belt machines, and vice versa, in ten minutes by an ordinary laborer. A special feature in this machine is in the construction of the cylinder cover (patented), which sends the dust back with the chaff where it belongs. The separator attachment is constructed on the vibrator principle, which has been demonstrated to be the best. The vibrating parts are so supported upon swinging hangers as to give the easiest and at the same time the most efficient movement for the purpose of separating the grain from the straw. The movement of the vibrating parts are so adjusted that one balances the other, allowing the machine to set steady. This part of the machine, which is usually so complicated as to give much trouble, is in this machine perfectly simple. A vibrating carrier of corrugated sheet iron and three agitators operated by one shaft does the work effectually, separating all the grain from the straw. A rice thresher similar to the above in general appearance is also shown. It is built much stronger, to sustain the greater strain, and has more space between the spikes of concave and cylinder, and less speed of cylinder to avoid cracking the kernels, but ample to thoroughly thresh out every grain from the straw, and runs lighter. Horse-power of various kinds are also displayed. The Farquhar patent gin power is specially deserving of careful attention. In fact, the exhibit throughout is of great merit, but too extensive for a detailed description in our columns. In addition to the above we may mention the display of plows, harrows, rakes, corn shellers, feed cutters, drills, &c., which are in great variety and attract the attention of farmers and planters from all sections of the country. Mr. Farquhar commenced manufacturing some 13 years ago, and has built up an immense business all over this country, as well as in South America, Mexico and Europe. On the 7th of May last he had the misfortune to be burned out, losing about \$100,000 beyond insurance, but by indomitable energy the works are again in operation, and capable of meeting the immense demand which the merits of the articles will always command.

The German Exhibit at the Centennial.

Professor Reuleaux, of Berlin, who is one of the representatives of Germany on the jury of the Centennial Exhibition, asserts in a letter to the *National Zeitung* that by far the greater number of the German articles exhibited at Philadelphia are inferior to those of the same kind which have been sent from other countries. "The Germans in America," he says, "have for many years talked of what Germany would produce when she should be united and regenerated; they proudly foretold that their former fatherland would certainly surpass other nations in many respects, if not eclipse them altogether. Now that they see the very opposite has happened, they have become our bitterest critics, though indirectly they may prove to be our friends; for they are publicly setting before Germany truths which she would not believe when they were told her by her friends in Europe."

There are three principal criticisms, proceeds the professor, which are made on the German department in the Exhibition; first, that the leading principle of German industry is to produce things which are cheap and bad; secondly, that most German goods are not made to be beautiful in themselves, but to attract by an appeal to German patriotic feeling; and, thirdly, that German industry shows no progress whatever either in taste or in invention. He then says:

"I cannot refrain from a feeling of shame when I wander through our department of the Exhibition, and see nothing but Germanias, Bismarcks, Kaisers, Crown Princes, Red Princes, Bismarcks, Molkses and Rooms in porcelain, zinc, iron, terra cotta, lithographs, paintings, and embroideries. In our art products we have sustained a defeat equal to two Sedans. In the machinery department, too, seven eighths of the space seems to be taken up with Krupp's giant cannon—those killing machines, as the Americans call them, which stand like a menace among the pacific productions sent by the other nations. Is that really a true expression of Germany's 'mission'? Do we not by such demonstrations force other nations to believe that Germany is penetrated with a spirit of Chauvinism?"

"As to the third objection, I hear people say: 'We have found something to learn of all the nations which are represented at the Exhibition, except Germany; she teaches us nothing.' This is hard, but it is almost quite true. I cannot deny the general justice of these criticisms, and can only express a wish that many German manufacturers will come here, in order that they may see how much we have to learn and how much to forget."

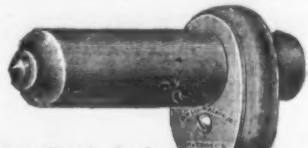
Proposed Pipe Line.—The *Railway World* says that a gigantic pipe line scheme, nominally intended to transport crude petroleum from the oil regions of Pennsylvania to Philadelphia and Baltimore is being agitated. The project contemplates the consolidation of the Pennsylvania Transportation Company with a pipe line company chartered by Maryland and several other companies, the president being Mr. Henry Harly, and the engineer in chief Gen. Herman Haupt. Baltimore is to be the first objective point, and after she is supplied Philadelphia and New York are next to be successively petroleumized in the new fashion.

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West Virginia Lubricating Native Rock Oil! Used by most of the Railroads in the United States, Canada and Europe, and by Mechanics on all kinds of Machinery. The Safest, Cheapest and Most Reliable Lubricator in the world. Obtain the High and Prize at the Paris Exposition. 24, 25, 26 and 27 Gravity. No. 25 CEDAR STREET, NEW YORK.



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Foster's Combination BELT TOOL.

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canners, Superheated Steam.

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use at Blast Furnaces.

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Counters, Indicators for ascertaining

the Horse Power.

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INDICATORS.

The Revolution Indicator is driven like

a governor, either from a horizontal or

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per minute made by a Steam Engine.

There are many engines which have to

run at varying speeds for different opera-

tions, also engines controlled entirely by

hand. For such, the Revolution Indicator

will be found particularly useful.

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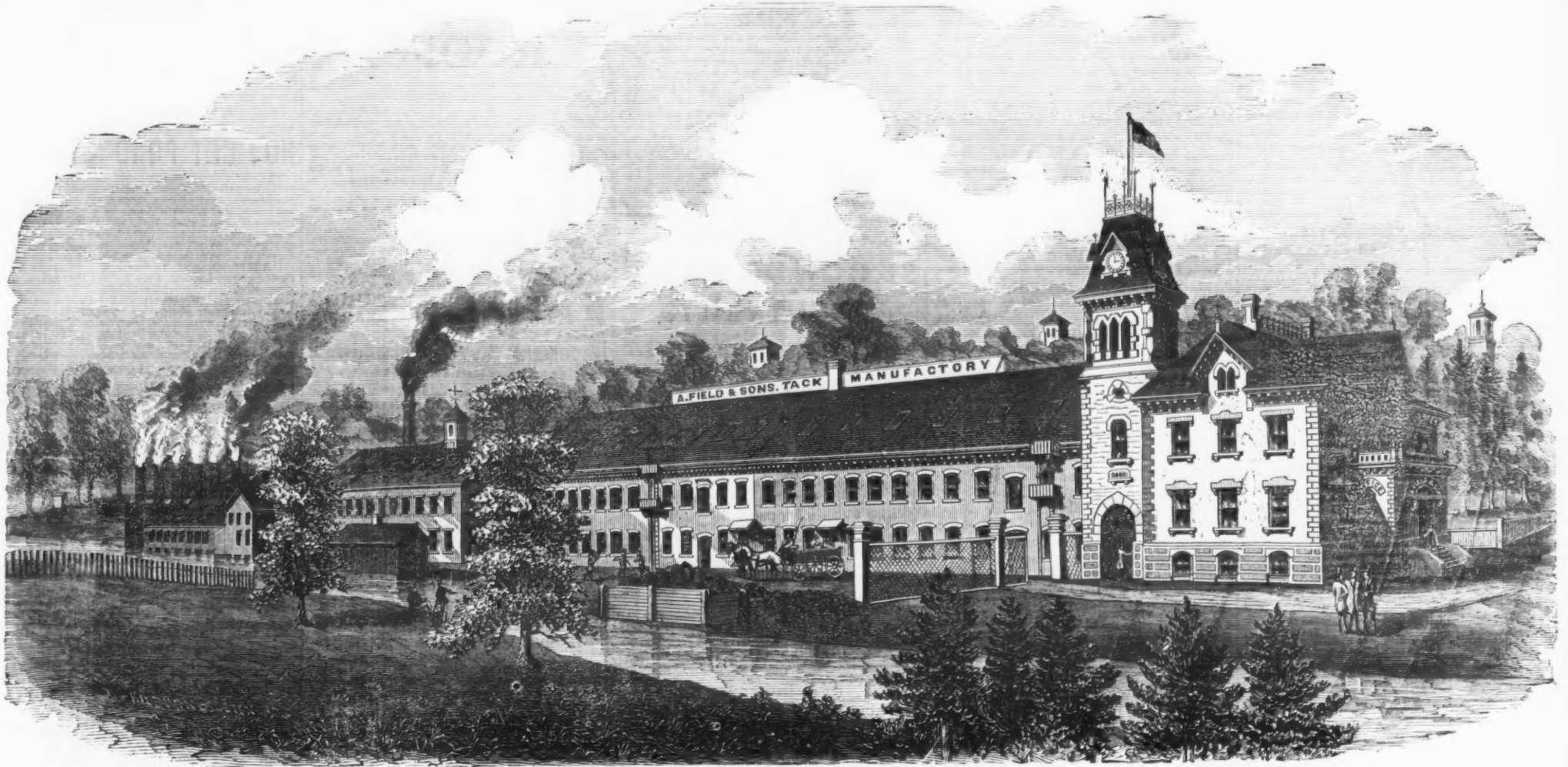
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all its branches.

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BRADS AND PATENT BRADS.

IRON
COPPER
TINNED
SWEDES IRON
UPHOLSTERERS'
CARD CLOTHING
PAIL AND TUB
GIMP
LACE
PATENT COPPER PLATED
LARGE HEAD CARPET

FINISHING
TRUNK
CLOUT
CHAIR
CIGAR BOX
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COPPER CUT

LEATHERED CARPET
TINNED CARPET
COLORED COATED CARPET
COFFIN LINING
MINERS'
BRUSH
LOOKING GLASS
SHOE OR LASTING
ROUND HEAD
ROOFING
EVERY STYLE OF

BOAT REGULAR
BOAT CHISEL POINTED
FINE TWO PENNY
FINE THREE PENNY
PATENT COPPER PLATED
CHANNEL
AMERICAN IRON SHOE
SWEDES IRON SHOE
ZINC SHOE
STEEL SHOE
CHARCOAL IRON SHOE

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do not seem disposed to take any further lar-
parcels, unless a very considerable demand
arises soon. Unless, therefore, holders
Lead prefer to keep what they have got, at
store any subsequent receipts, both here and
the West, rather than sell, lower prices may
be looked forward to. Foreign has of late been
rather pressed on the market here, but late
telegrams as well as mail accounts read more
encouragingly. We quote at the close, ordi-
nary Domestic, 7-10c.; currency, and Fine se-
lected, 7-25c.; currency; Foreign, 6½c. to
Manufactured continues steady at 8½c. to
Bar; 9½c. for Pipe, and 10c. for Sheet, less the
usual discount to the trade.

Spelter and Zinc.—There is a rumor the
Domestic Spelter has been offered as low as
7c., currency. We quote the same, nominally
7½c., currency. Should greater activity soon
be perceptible in the Brass regions, as is gener-
ally hoped and by some predicted with some
confidence, the business in Spelter will continue
a dragging one for some indefinite time longer
and in such an event it will be difficult to fore-
see what figure it may drop to. While this un-
certainty lasts inquiry for the Foreign article
has also wholly subsided, and we quote the
same, nominally, 7c. to 7½c., gold. Sheet Zinc
remains steady at 8½c. to 8¾c., gold, for Amer-
selman, and 9c. to 9¼c., currency, for Amer-
can.

Antimony.—A steady, moderate trade
continues to be done in this metal at 15½c. to 16c.
gold. The stock is much reduced, and when
finally exhausted it will be found that it can-
not be advantageously replaced, because of its
high prime cost.

IMPORTATIONS.

**Of Hardware, Iron, Steel and Metals into
the Port of New York, for the week end-
ing August 1, 1876:**

Hardware.	Sampson G. G. Pipes, 200
Budd & Co. Metalware, cs., 21	Whitney A. R. & Bro. Iron flues, 136
Barton, Alexander & Waller, Mdse. pkgs., 1	Order.
Baldwin Bros. & Co. Gun barrels, cs., 7	Spiegel, lots, 1
Boker Hermann & Co. Mdse. pkgs., 2	Iron tubes, cs., 2
Cobly J. L. & Co. Wire rods, bbls., 136	Scrap, tons, 2
Drew, Aymar & Co. Chairs, 3	Steel.
Chaires, csks., 3	Abbott J. Wire, bbls., 12
Fuller Bros. Mdse. pkgs., 2	Brown Wm. Cases, 16
Folsom H. & D. Mdse. pkgs., 8	Bundles, 27
Field Alfred & Co. Cases, 4	Carey & Moen, Wire, bbls., 94
Chaires, csks., 38	Naylor & Co. Bundles, 418
Moore's J. P. Sons, Arms, cs., 1	Cases, 12
Schoverling & Daly, Arms, cs., 10	Tires, 13
Strasburger, Pfeiffer & Cases, 1	Scott Thos. Bundles, 100
Schuyler Hartley & Gram- ham rods, cs., 15	Sulzbacher, H. yman n., Wolf & Co. Bundles, 11
Van Wart & McCoy, Cases, 15	Packages, 40
Ward Aaline, Mdse. pkgs., 11	Woodford W. O. Cases, 8
Wiebusch & Hliger Hwd. Mdse. pkgs., 33	Order.
Orner. Guns, cs., 50	Cases, 19
Bayonets, cs., 3	Tires, 54
Iron.	Bundles, 299
Alexandre F. & Son, Bars, 300	Metals.
Champion H. Cast, tons, 99	Cort N. L. & Co. Tin plates, bxs., 215
Cast, cs., 6	Dickerson, Van Dusen & Co. Tin plates, bxs., 65
Fuller Dana & Pitt, Bars, 515	Darrington & Co. Scrap lead, bbls., 6
Naylor & Co. Kilns, 607	Heroy & Marrenner, Sheet t. n. cs., 2
Spiegel, lots, 1	Noel, Saurel & Marneffe, Tin, sheets, cs., 18
Scrap, csks., 148	Puelps, Rodget & Co. Tin plates, bxs., 11-
Bars, 7093	Black taggers, bxs., 100
Perkins, Livingstone & Scrap, lbs., 100,000;	Antimony, csks., 50
bxs., 127	Tin, slabs, 200
	Order.
	Tin plates, bxs., 4124
	Spelter, plates, 11,957
	Tin, slabs, 2286
	Without Bill, 1,567
	Tin, ingots, 304
	Antimony, csks., 17

OLD METALS, PAPER STOCK, &c.

The sales of Old Metals still continue very
light, and the market is without any activity.
There is a better feeling, however, in connec-
tion with Lead, and quotations are more easily
obtained. Copper is very dull, and Composi-
tion is also in very little request. Brass is a
prime more active, but not sufficiently so to alter
prices. Store Plate and Machinery Iron are
without demand, and prices have declined.
The market for Rags and Paper Stock still
continues dull, and quotations are growing
weaker. Soft Woollens have declined ½c. a
pound. We quote the following as the current
purchasing rates:

Old Metals.—Copper, 15c. to 16c. per lb.; Yel-
low Metal, 10c.; Brass, 9½c.; Composition,
heavy, 10c. to 11c.; Lead, solid, 5½c.; Tea Lead,
cs.; Zinc, 4c.; Pewter, No. 1, 13c.; do. No.
2, 8c. to 10c.; Spelter, 5½c.; Wrought Iron,
21 per ton; Light do., \$12 per ton; Store
Plate, \$5 per ton; Machinery, do., \$10 per ton;
Soft Iron, \$9 per ton.

Rags, &c.—Canvas, Linen, 4½c. to 5½c.; do.
Cotton, No. 1, 5½c.; No. 2, 2½c.; White,
No. 1, 5c.; No. 2, 4c.; Colored, do., 2c.;
Mixed, Woollen, 2c. to 3c.; Soft, do.,
3c.; Gunny Bagging, 1½c.; Jute Butta,
½c. to 2c.; Kentucky Bagging, 3c.; Book
stock, 3c.; Newspaper Stock, 2½c.; Waste
paper and Scraps, 1½c.; Kentucky Bale Rope,
cs.; Oakum Junk, No. 1, 4½c. to 5c.; do. No.
2, 3c.; Tarred Shaking, 1c. to 1½c.; Grass
rope, 2½c. to 3c.

COAL.

According to the programme, the price of
coal for the present month has been ad-
vanced 15 cents per ton. Naturally
this has increased the demand slight-
ly, and in and about this city we pre-
sume about the usual amount of Coal for
the season of the year is being taken. The
newspapers are discussing the condition of
trade and predicting the downfall of the com-
bination, and, doubtless, to a certain extent
be influencing public opinion. The foundation
for the rumors circulated are doubtless to be
found in some stock broker scheme, for it
is hardly seems possible that, with the present
condition of affairs, the combination can go to
pieces; it is possible, it is true, but so very un-
probable that it is hardly worth while to speak
of it. Dealers and contractors everywhere
have laid in stocks and are indebted to the
companies. They have bought with the
idea that the price touched bottom some
time ago, and will not be lower for the
year. To break up the combination at the
present time it would be necessary to slaughter
these men, because prices would drop to a very

low figure on account of the war for the trade which would at once spring up. The losses which would be entailed upon the companies from the inability of these men to pay would be severely felt. In addition to this a most exhaustive and unprofitable struggle would begin to obtain and keep the trade, which would in itself be ruinous to the companies at such a time as this with the demand so greatly reduced as it is. In whatever way the question is regarded, it is in the very highest degree improbable that the combination will break up; it is certainly a question which it is not worth while to consider. It is already a matter of discussion whether the price of Coal will not be raised another 15 cents next month. The opinion that it will take place has been freely expressed by gentlemen connected with the companies who were in a position to know whereof they spoke. That this rise will be considered advisable is probable in view of the increased demand which comes at this season of the year. As compared with other seasons the state of the market is about what is to be expected at this period; there is a little increase in the demand, as people prepare for the fall and winter, but in general there is but little activity. Freight rates remain unchanged, though, as the volume of business increases, they will probably go up. The condition of the bituminous trade continues without any noticeable change. Below are the quotations for the month:

Cumberland, at Georgetown.....	\$3.50 @ \$3.75
West Virginia, at Baltimore.....	4.50 @ 6.00
Kittanning f. o. b., Baltimore.....	4.25 @ 4.35
Newburg Ortel, at ".....	4.50 @ 4.60
Despard, at Baltimore.....	4.50 @ 4.60
Broad Top, at South Amboy.....	4.50 @ 4.60
Morrisdale, Wiggins.....	4.50 @ 4.60
Canard.....	4.50 @ 4.60
at Philadelphia.....	4.50 @ 4.60
Consolidation Coal Co. f. o. b., George- town.....	3.50 @ 3.65
Consolidation Coal Co. f. o. b., Balti- more.....	3.50 @ 3.65
In barges at New York.....	3.50 @ 3.65
Maryland Coal Co. f. o. b., Baltimore.....	3.50 @ 3.65
Maryland Coal Co. f. o. b., Georgetown.....	3.50 @ 3.65

PRICES FOR JULY.

	Lump.	Steamer.	Broken.	Egg.	Stove.	Chestnut.
PENNSYLVANIA COAL CO., at Weehawken, N. J.						
Pittston.....	4.90 @ 5.00	5.10 @ 5.20	5.30 @ 5.40	5.50 @ 5.60	5.70 @ 5.80	5.90 @ 6.00
DELAWARE AND HUDSON CANAL CO., at Weehaw- ken, N. J.						
Lackawanna.....	4.90 @ 5.00	5.10 @ 5.20	5.30 @ 5.40	5.50 @ 5.60	5.70 @ 5.80	5.90 @ 6.00

LEHIGH AND WILKES-BARRE COAL CO., f. o. b. at Port Johnson, N. J.						
Old Company's Summit.....	5.40 @ 5.50	5.60 @ 5.70	5.80 @ 5.90	6.00 @ 6.10	6.20 @ 6.30	6.40 @ 6.50
Honey-Brook Lehigh.....	5.40 @ 5.50	5.60 @ 5.70	5.80 @ 5.90	6.00 @ 6.10	6.20 @ 6.30	6.40 @ 6.50
Wilkes-Barre.....	4.90 @ 5.00	5.10 @ 5.20	5.30 @ 5.40	5.50 @ 5.60	5.70 @ 5.80	5.90 @ 6.00
Plymouth Red Ash.....	5.10 @ 5.20	5.30 @ 5.40	5.50 @ 5.60	5.70 @ 5.80	5.90 @ 6.00	6.10 @ 6.20

PHILADELPHIA AND READING COAL AND IRON CO., at Port Richmond, Philadelphia.						
Hard White Ash Coal.....	4.25 @ 4.35	4.45 @ 4.55	4.65 @ 4.75	4.85 @ 4.95	5.05 @ 5.15	5.25 @ 5.35
Free Burning White Ash Coal.....	4.25 @ 4.35	4.45 @ 4.55	4.65 @ 4.75	4.85 @ 4.95	5.05 @ 5.15	5.25 @ 5.35
Schuykill Red Ash.....	4.25 @ 4.35	4.45 @ 4.55	4.65 @ 4.75	4.85 @ 4.95	5.05 @ 5.15	5.25 @ 5.35
Shamokin.....	4.25 @ 4.35	4.45 @ 4.55	4.65 @ 4.75	4.85 @ 4.95	5.05 @ 5.15	5.25 @ 5.35
Lorberry.....	4.25 @ 4.35	4.45 @ 4.55	4.65 @ 4.75	4.85 @ 4.95	5.05 @ 5.15	5.25 @ 5.35
Lykens Valley.....	4.25 @ 4.35	4.45 @ 4.55	4.65 @ 4.75	4.85 @ 4.95	5.05 @ 5.15	5.25 @ 5.35

Delivered at the Williamsburg Yard.						
Hard White Ash Coal.....	4.90 @ 5.00	5.10 @ 5.20	5.30 @ 5.40	5.50 @ 5.60	5.70 @ 5.80	5.90 @ 6.00
Free Burning White Ash Coal.....	4.90 @ 5.00	5.10 @ 5.20	5.30 @ 5.40	5.50 @ 5.60	5.70 @ 5.80	5.90 @ 6.00
Schuykill Red Ash.....	4.90 @ 5.00	5.10 @ 5.20	5.30 @ 5.40	5.50 @ 5.60	5.70 @ 5.80	5.90 @ 6.00
Shamokin.....	4.90 @ 5.00	5.10 @ 5.20	5.30 @ 5.40	5.50 @ 5.60	5.70 @ 5.80	5.90 @ 6.00

DELAWARE, LACKAWANNA AND WESTERN, at Hobo- ken, N. J.						
Scranton.....	4.90 @ 5.00	5.10 @ 5.20	5.30 @ 5.40	5.50 @ 5.60	5.70 @ 5.80	5.90 @ 6.00

FREIGHTS—PER TON OF 2240 LBS.

PORTS.	From Philadelphia, Hoboken, South Am- boy, and Weehawken.	From Baltimore.	From Georgetown.
Augusta, Me.....	1.75	1.75	1.75
Albany.....	1.75	1.75	1.75
Amesbury, Mass.....	1.75	1.75	1.75
Bangor, Me.....	1.75	1.75	1.75
Bath, Me.....	1.75	1.75	1.75
Baltimore.....	1.75	1.75	1.75
Boston, Mass.....	1.75	1.75	1.75
Bridgeport, Ct.....	1.75	1.75	1.75
Bristol, R. I.....	1.75	1.75	1.75
Cambridge, Mass.....	1.75	1.75	1.75
Derby.....	1.75	1.75	1.75
Dighton.....	1.75	1.75	1.75
East Cambridge.....	1.75	1.75	1.75
Fall River.....	1.75	1.75	1.75
Hackensack.....	1.75	1.75	1.75
Hallowell, Me.....	1.75	1.75	1.75
Hartford.....	1.75	1.75	1.75
Hoboken.....	1.75	1.75	1.75
Hudson.....	1.75	1.75	1.75
Jersey City.....	1.75	1.75	1.75
Lynn, Mass.....	1.75	1.75	1.75
Middletown.....	1.75	1.75	1.75
Mystic.....	1.75	1.75	1.75
Newark.....	1.75	1.75	1.75
New Bedford.....	1.75	1.75	1.75
Newburyport.....	1.75	1.75	1.75
New Haven.....	1.75	1.75	1.75
New London.....	1.75	1.75	1.75
Newport.....	1.75	1.75	1.75
New York.....	1.75	1.75	1.75
Norwalk.....	1.75	1.75	1.75
Norwich.....	1.75	1.75	1.75
Pawtucket.....	1.75	1.75	1.75
Philadelphia.....	1.75	1.75	1.75
Portland.....	1.75	1.75	1.75
Portsmouth, N. H.....	1.75	1.75	1.75
Providence.....	1.75	1.75	1.75
Poughkeepsie, N. Y.....	1.75	1.75	1.75
Rockland.....	1.75	1.75	1.75
Rockport.....	1.75	1.75	1.75
Saco.....	1.75	1.75	1.75
Sag Harbor.....	1.75	1.75	1.75
Salem, Mass.....	1.75	1.75	1.75
Salisbury Pt., Mass.....	1.75	1.75	1.75
Stamford.....	1.75	1.75	1.75
Saybrook.....	1.75	1.75	1.75
Stonington.....	1.75	1.75	1.75
Taunton.....	1.75	1.75	1.75
Troy.....	1.75	1.75	1.75
Warren, R. I.....	1.75	1.75	1.75
Wareham.....	1.75	1.75	1.75
Weymouth.....	1.75	1.75	1.75
Wilmington, N. C.....	1.75	1.75	1.75

* 3c. per bridge extra. † And Sound Towing.
Harbor Freight, 40 cents.

PHILADELPHIA.

Office of The Iron Age, 220 South Fourth St.,
Philadelphia, Aug. 1, 1876.

PIG IRON.—The market throughout the week has been quiet, as usual, and no sales of importance have transpired. Prices are without change, but a steady feeling prevails through-

out the trade. No speculative element is apparent, however, and transactions are confined to supplying immediate wants. Consumption is becoming smaller, and although production is curtailed, also, stocks are not materially reduced. Gray Forge Iron is comparatively scarce, but there is no special demand, hence prices are unchanged. Bids have been made at figures something below our quotations, but holders were firm, and no business has resulted. We quote: No. 1 Foundry, \$23 to \$25; No. 2 ditto, \$20 to \$21; Gray Forge, \$19 to \$22; and Mottled, \$18 to \$19; market very quiet.

BLOOMS.—The demand and prices are unchanged as follows: Charcoal Scrap Blooms, \$47; Charcoal Ore Blooms, \$41 to \$42; Charcoal Billets of superior quality, from \$60 to \$62; and Bars for converting into steel, made of best Champlain Iron, \$75.

BAR IRON.—There is no life in the trade, and there are no signs of improvement in the present aspect of things. The mills are very irregularly employed, and are running only sufficient to meet the present limited demand. Under these circumstances prices are weak, and only a few brands command the outside quotations. Others are sold at lower prices, in some cases below the inside quotation, and even then no disposition is shown to operate largely. We quote the market dull and weak, at 2-15c. to 2-35c., according to brand.

RAILS.—Business is very quiet, and although there are some inquiries, and occasionally sales of small parcels, the aggregate amount of new transactions is unimportant. In this connection we may state that one of our largest industrial establishments, connected with the railway interests, has recently reduced the number of employees by about 500 men, and the immediate outlook is far from encouraging. We continue our late quotations, with a very dull market, viz.: Steel Rails, at mills, \$57 to \$58; and Iron Rails, \$38 to \$42.

OLD RAILS.—There is no special change to note. The offerings are light, and with no demand of importance we continue our late quotations, viz.: \$23-50 to \$23, with an exceptional sale of a choice lot at \$24.

SCRAP.—Small lots are offering at lower prices, but holders of round lots are firm at full rates, although the demand is not quite so active. We quote: Cast, \$16 to \$19; Wrought, \$25 to \$28.

NAILS.—The demand is still very quiet, but quotations are unchanged, viz.: \$3-25, with 25 to 35 per cent. discount to buyers of large lots.

TIN PLATES.—The late advance is well maintained, and with an active market. We quote in United States currency as follows: I. C., 10x14, \$8-25 to \$8-75; I. X., 10x14, \$10-50 to \$11; Best Charcoal, leaded, 28x20, \$15 to \$16; other good brands, \$14-50 to \$15; good fair, \$14 to \$14-50; Bright Tin, for cans, &c., \$7-25 to \$7-50; good Bright Tin, do., \$7-25 to \$7-50; Coke, leaded, 14x20, \$6-87½ to \$7-25.

LEAD.—Common Domestic is but little sought after, but stock is small and market firm, at 7-10c. to 7-12½c., currency. At St. Louis 2500 pigs sold at 6-75c., equal to 7-10c., currency, here. Foreign remains dull and nominal, at our last quotation.

SHOT.—The market is unchanged. We quote, with 10 per cent. discount, cash in 30 days: Drop Shot in 25 lb. bags, 9½c.; in 5 lb. bags, 10½c.; Buckshot in 5 lb. bags, 10½c.; Bar Lead in 5 oz., ½ lb. and 1 lb. bars, 8½c.

OLD METALS.—Brass and Copper are weaker. Old Lead is scarce and wanted. We quote: Heavy Old Copper, 10½c. to 17c.; Light Tinned Copper, 15½c.; Copper Bottoms, 14c.; Heavy Red Brass, 13½c.; Light Red Brass, 13c.; Heavy Yellow Brass, 11c.; Light Yellow Brass, 10c.; Heavy Clean Pipe Lead, 6c.; Junk Lead, 5½c.; Tea Lead, Light Paper, 6c.; Tea Lead, Heavy Paper, 5c.; New Zinc Clippings, 4½c.; Old Sheet Zinc, 4c.; Yellow Brass Turnings, 8c. to 10c.; Red Brass Turnings, 10c. to 12c.; Plumbers' Lead Joints, 6½c.

PITTSBURGH.

Office of The Iron Age, 14 Fifth Avenue,
Pittsburgh, Aug. 1, 1876.

PIG IRON.—There has been more inquiry and an increased volume of business during the past week, but there is not that activity there usually is about this time, and the indications are that the mills generally will buy only as their immediate wants require. The general tone of the market is firm, and but few if any consumers even have hopes of being able to obtain the raw article below current rates, but there is a general disinclination to anticipate future wants, which may be attributed to the fact that the outlook is not as favorable for finished goods as it ought to be and usually is at this particular time. Producers, however, are hopeful of being able to obtain better rates this fall, notwithstanding the indications just now are not very favorable. Bituminous Coal Smelted Irons quoted as follows: Foundry Nos. 2 and 1, \$23 to \$25, 4 mos.; Gray Forge, \$21 to \$22-50; White and Mottled, \$18 to \$20.

MANUFACTURED IRON.—Some of our manufacturers talk encouragingly in regard to the future, while others have gloomy forebodings. It is hoped, however, that the expectations of the former may be realized. At the present time business is very generally reported dull, and some of the mills, which were stopped early last month to take stock and make repairs, have not yet been started. As telegraphed by your correspondent from Cincinnati, last Tuesday, a change has been made in discounts here; the card remains unchanged, but discounts were reduced one and a half tenths of a cent per pound. The current rates are as follows: Less than 10 tons..... 2-35 rates.
From 10 to 30 tons..... 2-35 rates.
Over 30 tons..... 2-15 rates.

NAILS.—The Nail trade continues dull, as it nearly always is during July, but an increased demand this month is expected. No change in prices; for less than 200 kegs, \$2-85, 60 days; 200 kegs and upward, \$2-75, 60 days, with usual

discount of two per cent. for cash. Horse shoes unchanged at 4½c., cash; Mule Shoes, 5½c., cash, with an increasing trade.

STEEL.—Trade has been rather dull during the month just closed, but it is expected orders will soon commence to come forward more freely. American has almost entirely supplanted the foreign article all through the country, hence the largely increased business in the former as compared with former years, and it is steadily increasing. About the only complaint heard is that prices have been cut to such an extent that there is little or no margin for profit.

WINDOW GLASS.—Continues dull, and no general improvement is looked for until the latter part of the month. No change in rates. The next regular meeting of the Western Association convenes in Chicago, if your correspondent is not mistaken, on the 26th inst.

SALE OF THE "SABLE IRON MILL."—The Sable Iron and Nail Mill, lately owned by Zug & Co., was put up at public sale last Thursday. It was started at \$155,000, and knocked down at \$170,000 to McIntosh, Hemphill, Zug, Keating and Jack. This property, prior to the panic, was estimated to be worth from \$600,000 to \$700,000, and is certainly a great bargain at the price it was sold for. It will at once be put in repair and started up by the new owners about the first of next month.

The large pipe foundry of William Smith & Son, said to cost about \$300,000, was also sold at public sale the other day for \$55,000, John Moorhead, Pig Iron dealer, being the purchaser.

BOSTON.

JULY 29.—Pig is indeed listless, the reports of the week seeming to be a profusion of gossips of foundries to close until the middle of August. There have been no sales nor any inquiries, while the market seems to have lost all quotable tone. Bar is offering all the way from \$49 to \$55 per ton for guaranteed refined, with very little business done, but the bulk of the sales that are made are at \$49 to \$50, and an occasional odd customer being let in at still a slight fraction less. Exactly what has been the cause of this weakening of prices it is difficult to tell, but the fact is quite apparent that it is only the cash customers who get the benefit of these low ranges. This condition of affairs is a repetition of what has been the experience of the early spring, but the movement seems to have been inaugurated from a new quarter, which the trade generally propose to meet.

The business is again a losing one, which can hardly be an encouraging fact for the contemplation of the dealers in New York and Philadelphia, who, although a little weak for the past few weeks, will hardly slide down to meet the market at the Hub. Steel continues to report a quiet trade with prices steady. We quote: American Tool, 14c. to 15c.; American Machinery, 8½c. to 9½c.; Bessemer Tires, 5½c.; Sweet's Excellence Tires, 7½c.; English Tool, 15½c., gold. Copper is very dull with the market vacillating between 20c. and 20½c., just according to the quantity wanted. There are enough who have bought under 20c., and are now willing sellers, to control the ambition of the mining companies, who find it extremely slow and tedious working inot up again on a naturally sluggish market. For manufactured we quote: New Sheathing, 31c.; Bolts and Braziers, 32c.; Yellow Metal Bolts, 26c.; do. Sheathing, 21c.; Lead is steady at an advance of ½c. to ¾c. for Domestic. The supply of Foreign is exhausted, and dealers have no occasion to give it a quotation. We quote: Pig, 7½c. to 7½c. for Domestic; Sheet, 10c.; Pipe, 9½c., currency; Tin Lined Pipe, 10½c.; Bar Lead, 9½c., less usual trade or 10 per cent. discount. Antimony is nominally quoting at 10c., gold, with New York parties still offering Boston deliveries at 15½c. to 15½c. Spelter is very listless at 7½c. to 7½c., although the combination figure, 8c., is still proclaimed. Tin is firmly held, with a small trade in pig. Plates are in good request. We quote: Straits, 17½c.; Banca, 21½c.; Refined English, 17½c., gold. We quote Plates: Charcoal I. C., \$7-50; Coke, \$6-25 to \$7-00; and Terne at \$7-50 to \$8, gold.—Commercial Bulletin.

CINCINNATI.

Messrs. L. R. HULL & Co., under date of July 29, write us as follows: Pig IRON.—No important changes can be reported, the market retaining the same quiet—almost monotonous—features that have for so long characterized it. We are now, however, in what is usually called the dulllest month in the year, and it is reasonable to look for at least a somewhat improved inquiry beginning soon after August 1. The more favorable reports of the crops received are somewhat encouraging, and a better feeling is noticeable in business circles than if the damage done in certain sections by the late rains had proved more extensive or disastrous. Cincinnati being the largest forwarding market for Pig Iron in the country is directly affected by the condition of the large territory supplied. Prices as below rule the same as last week:

CHARCOAL.

Hanging Rock No. 1.....	\$23-50 @ 24-00—4 mos.
" No. 2.....	22-50 @ 23-00—4 mos.
" No. 3.....	21-00 @ 22-00—4 mos.
Southern Brands No. 1.....	23-00 @ 24-00—4 mos.
" No. 2.....	21-00 @ 22-00—4 mos.
Virginia No. 1.....	23-00 @ 24-00—4 mos.
" No. 2.....	21-00 @ 22-00—4 mos.
" No. 3.....	21-00 @ 22-00—4 mos.

STONE COAL AND COKE.

Hanging Rock No. 1.....	\$21-00 @ 22-00—4 mos.
" No. 2.....	19-00 @ 20-00—4 mos.
Red Short No. 1.....	26-00 @ 27-00—4 mos.
" No. 2.....	23-00 @ 24-00—4 mos.
Am. Scotch, No. 1.....	24-00 @ 25-00—4 mos.

COLD BLAST.

Hanging Rock Car Wheel No. 1.....	\$40-00 @ 45-00—4 mos.
" No. 2.....	35-00 @ 40-00—4 mos.
Southern Br'ds.....	30-00 @ 35-00—4 mos.
Machinery and Forge.....	30-00 @ 35-00—4 mos.

ST. LOUIS.

Messrs. SPONNER & COLLINS, Iron commission agents, 409 North Third street, St. Louis, under date of July 28, report the iron market as follows: Our market is still in a gloomy and unsatisfactory condition. Demand very light and consumers are only buying for present wants.

Mo. Stone Coal, No. 1 F'dry.....	\$25-00 @ 26-00—4 mos.
" No. 2 F'dry.....	23-00 @ 24-00—4 mos.
" No. 3 F'dry.....	22-00 @ 23-00—4 mos.
" No. 4 F'dry.....	21-00 @ 22-00—4 mos.
" No. 5 F'dry.....	20-00 @ 21-00—4 mos.
" No. 6 F'dry.....	19-00 @ 20-00—4 mos.
" No. 7 F'dry.....	18-00 @ 19-00—4 mos.
" No. 8 F'dry.....	17-00 @ 18-00—4 mos.
" No. 9 F'dry.....	16-00 @ 17-00—4 mos.
" No. 10 F'dry.....	15-00 @ 16-00—4 mos.
" No. 11 F'dry.....	14-00 @ 15-00—4 mos.
" No. 12 F'dry.....	13-00 @ 14-00—4 mos.
" No. 13 F'dry.....	12-00 @ 13-00—4 mos.
" No. 14 F'dry.....	11-00 @ 12-00—4 mos.
" No. 15 F'dry.....	10-00 @ 11-00—4 mos.
" No. 16 F'dry.....	9-00 @ 10-00—4 mos.
" No. 17 F'dry.....	8-00 @ 9-00—4 mos.
" No. 18 F'dry.....	7-00 @ 8-00—4 mos.
" No. 19 F'dry.....	6-00 @ 7-00—4 mos.
" No. 20 F'dry.....	5-00 @ 6-00—4 mos.
" No. 21 F'dry.....	4-00 @ 5-00—4 mos.
" No. 22 F'dry.....	3-00 @ 4-00—4 mos.
" No. 23 F'dry.....	2-00 @ 3-00—4 mos.
" No. 24 F'dry.....	1-00 @ 2-00—4 mos.
" No. 25 F'dry.....	0-00 @ 1-00—4 mos.

Massillon Iron, No. 1.....	20-00 @ 21-00—4 mos.
" No. 2.....	19-00 @ 20-00—4 mos.
" No. 3.....	18-00 @ 19-00—4 mos.
" No. 4.....	17-00 @ 18-00—4 mos.
" No. 5.....	16-00 @ 17-00—4 mos.
" No. 6.....	15-00 @ 16-00—4 mos.
" No. 7.....	14-00 @ 15-00—4 mos.
" No. 8.....	13-00 @ 14-00—4 mos.
" No. 9.....	12-00 @ 13-00—4 mos.
" No. 10.....	11-00 @ 12-00—4 mos.
" No. 11.....	10-00 @ 11-00—4 mos.
" No. 12.....	9-00 @ 10-00—4 mos.
" No. 13.....	8-00 @ 9-00—4

perhaps, just repeat the current prices as an aid to memory: Marked Staffordshire bars, £9; Lord Dudley's bars, £9 12/6; single sheets, fair quality, £9 7/6 to £9 10/; good sheets £10; Severn (single) sheets £13; and B sheets of Messrs. Baldwin & Co., £16; common bars are easy at £7 to £7 10/. Lord Dudley's sivet iron fetches, £12 for single and £15 10/ for treble best. In all respects the *status quo ante* was well maintained, and we are now no wiser, or in any business respect better, than prior to the gatherings. The iron-masters, of course, met in large numbers and ascertained each others' "experiences" in a tolerably thorough manner. From beginning to end the Birmingham meeting was a Jeremiad—all lamentation, and metaphorical gnashing of teeth. Few sanguine spirits were to be found, and even their prophetic thermometer did not rise high nor seek lofty flights. There was a general opinion that we have not yet reached the "bottom of the hollow," and that we shall not "see land" for another six months at the earliest. On all sides conversation turned on the reductions of wages enforced at the West Coast blast furnaces, in the Lancashire cotton trade, and the prospective results of the tentative movement for re-establishing the ten hours system.

DYNAMITE AGAIN.

Our somewhat volatile acquisition, dynamite, would appear to be affected with a liking for sea bathing at this season of the year—an indiscretion which may well be pardoned in so fiery a disposition and temperament. The other day a Boulogne pilot, when off Cape Grisney in his boat, picked up 12 floating cases, each containing about half a hundred weight. Off Dover a pilot rescued 23 other cases, each filled with this interesting explosive. History saith not what was done by him of Boulogne, but it is recorded that when the Dover man tried to run in his cargo the harbor master rejected him and it with contumely and high-handed scorn, so that the ancient mariner himself took alarm and betook himself out to sea, where he carefully and tenderly dropped the boxes overboard. May they remain there undisturbed. At a Yorkshire colliery, near Pontefract, some cartridges of this ilk "went off" in a hurried manner last week, and carried with them numerous specimens of the "human form divine," which said specimens would have been deeply lamented by three disconsolate laborers, had not one been too much overcome to find his feelings—and his limbs. He was, in fact, dismembered, but two still weep lamentingly and speak slightly of all explosives. Not so a commercial traveler in the West of England, who was last week fined £25 for sending a quantity of dynamite unlabeled by railway. This trusting soul said he was well acquainted with dynamite and its nature, seeing that he "lived with it," having frequently 500 lbs. in the house and 20 lbs. in his bedroom. Even in court he assured the magistrates he had some with him, and pulled a lump from his pocket. Such affection is truly touching. It is, indeed, a sight to make one feelingly observe that the reciprocity is such during life that in death they will not be divided. Stay! the man may be divided—but no matter.

ANOTHER TERRIBLE EXPLOSION.

Steam, notwithstanding the preference for dynamite, gun cotton or other notions, is still able to prove its power now and then, and to demonstrate its slaughtering capabilities. The accident on board the *Thunderer*, for instance, on Friday last was a proof of this. That vessel, the largest in the world, was being tried over the measured mile in Stokes Bay, off Portsmouth, when one of the boilers burst with such terrible effect that 15 men were killed on the spot, and 60 injured so dreadfully that at the time of my writing the dead number 36, and 15 others are not expected to recover. The cause of the disaster is as yet unascertained, but it would appear to have been a defect either in the safety valve or in one of the boiler plates. The *Thunderer* had 26 engines of one or other sort on board, the steam being supplied from eight boilers heated by 32 furnaces. Her main propelling engines are of 800 horse-power. The Queen happened to be near in her yacht when the explosion occurred, and she has since sent many inquiries relative to, as well as material assistance for, the unfortunate sufferers. The vessel itself is believed to have been greatly damaged internally.

TROPICAL HEAT.

We are now passing through a period of fully tropical heat, the temperature for a week having been 126° to 135° in the sun, and 80° to 88° in the shade. At the iron works the puddlers have been compelled to stop during the day. At Bristol, on Saturday, two men died from sunstroke, one of them, singularly enough being a soldier on his way home from India to Ireland. The weather is the hottest we have experienced for several years.

FURTHER COMMERCIAL STOPPAGES.

A Cardiff paper (*Western Mail*) announces that the Wayne's Merthyr Steam Coal and Iron Works Company (Limited), and Powell's Llantristyllt Collieries Company (Limited), have been compelled to suspend. It was also reported, but has since been partially contradicted, that Mr. Henry Spark, of Darlington, had suspended with £200,000 liabilities.

SCOTCH PIG IRON TRADE.

Matters remain very quiet at Glasgow, where the annual fair holidays are now current. There is no particular alteration in any respect, makers' prices having a tendency to go down. Freight is unchanged. There are 67,859 tons in Connal's stores.

Messrs. James Watson & Co. said (July 13th, evening): "In the early part of this week the price of warrants dropped from 56/6 to 56/; cash, but during the past two days there has been more business doing, and the market advanced to 56/3, closing this afternoon sellers at 56/5; buyers, 56/4 1/2. Owing to the annual holidays business will not be resumed in our market until Tuesday first. Shipments last week were 7092 tons, against 13,215 tons in the corresponding week of 1875." We quote:

	No. 1.	No. 3.
G. M. B., at Glasgow.....	57/	55/
Gartsherrie, ".....	54/6	51/
Goltness, ".....	57/	55/
Summerlee, ".....	61/	56/
Langloan, ".....	56/6	56/6
Carabrook, ".....	59/	56/6
Calder, at Port Dundas.....	63/	56/6
Glenarnock, at Ardrossan.....	63/	57/
Edginton, ".....	57/	56/
Dalmellington, ".....	57/	56/
Shotts, at Leith.....	58/	56/
Kinnaird at Boness.....	58/6	54/6

Messrs. John E. Swan & Bros.' prices current, of same date, give the quotations at 6d. per ton, lower in most instances. The later circular of Messrs. Wm. Colvin & Co. shows very slight variations from the above.

THE CLEVELAND IRON TRADE.

Mr. Waterhouse, the sworn accountant to the Northern Board of Arbitration, has just presented his quarterly report. It is interesting reading, and is as under:

GENTLEMEN: Having collected from the firms and companies belonging to your board the returns of their sales of manufactured iron

during the three months ending 31st May, and having verified the same by an examination of their books, I certify the average net selling price per ton for that period to have been £7 6/.

Beneath is a statement of the different classes of iron sold, and the average net selling price of each:

SALES DURING THE THREE MONTHS ENDING 31st MAY, 1876.			
Description.	Weight invoiced.	Per cent. of total.	Ave. net price per ton.
Tons. C. Q. Lbs.	£ s. d.	£ s. d.	£ s. d.
Rails.....	28,971 17 1 4	26.80	6 11 8/08
Plates.....	45,689 5 2 0	42.25	7 13 0/00
Bars.....	20,989 2 0 18	19.42	7 11 6/96
Angles.....	12,433 15 0 18	11.54	7 4 2/14
Total.....	108,084 0 0 22	100.00	7 5 11/89

Though the trade of the district was very bad for the February quarter, the succeeding three months show a diminution in the production to the extent of between 5000 and 6000 tons. The make of rails declined by nearly 16,000 tons on the last as compared with the February quarter; but plates rose by nearly 5000 tons. There is a decline in the price of each class of iron during the 1st quarter. As compared with the quarter ending February, rails show a reduction of 2/9, plates of 1/2, bars of 2/3 and angles of 1/2. The percentage of rails has been reduced from 33.37 to 26.80, while plates have mounted up from 35.89 to 42.25. It is due to this fact that the total average net price per ton for the quarter ending May of the four classes of iron is but 6d. per ton less, as compared with February. Plates, being nearly £1 per ton more than rails, have brought up the average. In an ordinary state of trade the production of rails more than doubles that of plates, but owing to the rail mills being so largely disengaged the order is reversed.

TRADES OF SHEFFIELD.

There is no local change worth noting. Not only are there present great complaints as to the absence of orders, but there are most serious outcries relative to the almost insurmountable difficulties in the way of getting in accounts. Travelers are still out on most of the home circuits, but they are not, as a rule, clearing their expenses, and write that they can get in hardly any money at all. France and Germany are, perhaps, paying as well or better than most countries with which the local houses do business, but even there buyers are furnishing but very small requisitions.

In respect of the iron trade proper there is no alteration to record. Two or three of the leading vendors of the merchant qualities with whom I have been in communication during the past few days tell me they continue to sell a few small lots for special purposes, but that they had, in reality, better do no business at all, seeing that not only is there no profit obtainable, but their outstanding accounts can only be got in by dint of the most persistent dunning. The works in and near Sheffield, Rotherham, &c., are doing next to nothing, especially those which are mainly devoted to the production of merchant iron. Most of their departments are closed either altogether or for most days of the week, and, as a necessary consequence, they are employing comparatively few workmen.

In pig iron there have been several sales, chiefly of foundry numbers and of hematite West Coast production. Many of the latter have been made for the purpose of stocking at the existing low quotations, the effect of which has been to send up prices, in some instances, about 2/6 per ton. Maryport Bessemer, Nos. 1 and 2, for instance, have recovered to that extent, and now stand at 72/6 and 70/ per ton respectively. One or two of the local houses have now very large stocks of hematite on hand. Spiegel Eisen of local make is still about £20 per ton, and is meeting with a general preference over that imported from Germany. There now appears to be a much better prospect for the future of those firms interested in the importation of iron ore from Spain—a matter which is sooner or later destined to exercise an important influence on the British rail trade. The chairman of the Bilbao Iron Ore Company, Limited, received a telegram on Saturday from Madrid, intimating that, after much discussion, the government had decided to minimize the duties on the exportation of ore from Spain. The municipality of Bilbao, in the vicinity of which the chief mines are situated, had asked the government to impose an export duty of fivepence per ton; but Sir John Brown, who happened to be in Spain on the business of the company, made such representations to the ministers, and was aided by Señor Balparda, Señor Ochoa and others, that the Cortes ultimately agreed to make the export duty half a real (1/2d.), the port tax to remain at one real (2 1/2d.) per ton as before. Señor Ochoa, I may add, is at present the guest of Sir John Brown, at Endcliffe Hall, Sheffield. This result is most satisfactory to all concerned, especially as the two leading Sheffield companies (John Brown & Co., and Charles Cammell & Co.), alone arranged some time ago to import about a million tons per annum. It was stated a couple of years or so ago that John Brown & Co. would erect several blast furnaces at their collieries for the express purpose of smelting Spanish ores, but of late I have heard nothing definite of the project. Nearly the whole of the cutlery houses are badly supplied with orders; the exceptions are two or three firms which are producing common goods by the aid of machinery.

STAFFORDSHIRE AND BIRMINGHAM.

There is little to add under this distinctive heading relative to these localities to what I have previously stated, except that some interest has been excited by the successful working of the Siemens and Lloyd direct process of iron making in the hands of the Darlaston Steel and Iron Company, of Wednesbury. Under this process ironstone is taken in the rough and is made straight into wrought iron of as good a quality as if it had been gone through the usual routine of the blast and puddling furnaces. The company exhibited samples at the quarterly meetings at the following quotations: Best charcoal bars, £18; sheets, £23 per ton; second quality, guaranteed equal to best Staffordshire bars, £10 for bars and £12 for sheets. The Belgians are said to be still carrying off all the orders for railroads, which they can deliver at 10/ per ton under the local prices.

WALES AND MONMOUTHSHIRE.

The total quantity of iron exported last week from these districts was 2140 tons of rails, 270 sheets, 320 pig iron and 140 bar iron. The preceding week the total of all descriptions was hardly 1500 tons. Cyfarthfa has this week sent 30 tons of bar iron to Naples—after the mill producing this class of iron had been idle for nearly two years. The tin plate works are doing next to nothing and all the ordinary brands are being sold at prices which leave no profit whatever.

THE METAL MARKETS.

have remained very quiet, even Tin having receded in value during the week just ended.

The *Mining Journal* says: "The week which has just closed has been unproductive of results, but the general tendency has been toward increased weakness. This was to be expected, and will probably continue to be the marked feature of our markets so long as the demand remains restricted as it now is, and production cannot be reduced within the requirements of the limited demand. It is impossible to foresee the end, and equally impossible to suggest a remedy. The laws which have always regulated the ebb and flow of commerce will do so still; things

must run their course. No artificial treatment will bring about a cure, but in time the evil will wear itself out, and vitality will once again mark the return to a better state of things. It is more than questionable whether for some time past as regards many metals sellers have realized anything but a loss, and probably buyers have as little reason to be satisfied with their purchases as sellers with their sales. But it is impossible that such a condition should continue interminably. Some have already solved the problem by formally closing their houses; others, although their works are still kept going, have virtually closed them by not laying themselves out to do business, because they see not their way to a profit. These may probably follow suit, and shut up their works entirely for a time. Meanwhile the difficulties under which the metal trade in England is laboring are not confined to this country. The various branches which are stagnant here are almost as dull and unremunerative as on the Continent; but consumption is going on, population is increasing, the requirements of civilized life are not growing fewer, and, as sure as the history of the past repeats itself in the present or future, so will these dull times be eventually succeeded by times of activity, when profits will be made by the masters, shared in by the men, and buyers will be satisfied that they too are not themselves losers, while conferring benefits upon and augmenting the gains of producers. But there are at present no signs of this much-to-be-desired halcyon era in the history of the metal trade of the country, and the inconvenience which is consequently experienced by many, whose livelihood depends upon the turn over of metals to a profit, whether as producers or shippers, or consumers, or mere speculators, must be in many cases very great.

Copper.—The market for copper throughout the week has been very quiet, and the prices of Chili produce have fallen £3, to-day's quotations being about £71 10/ for good ordinary brands. Wallaroo and Burra are quoted £77 to £77 10/; English copper is dull, at £78 for tough; 4 by 4 sheets, £84; strong sheets, £75. The demand for yellow metal is, in like manner, very limited. **Lead.**—There is no change to report in the value of this metal or in the position of the market, which continues very quiet. **Quicksilver** quoted £8. **Tin.**—The market for this metal has been growing gradually easier as the week advanced. Straits and Australian are now quoted at £73 to £73 10/.

Von Dadeisen & North report that in "Copper" very little has been done, and prices show a further decline. Chili bars have changed hands at £73 10/ for g. o. b., both spot and forward, and there are no buyers now above £73. Australian is also easier, Wallaroo obtainable at £77 10/; and Burra at £77. English raw and manufactured is very dull. **Tin** has declined since our last. Straits and Australian are now obtainable at £73 10/; and for forward delivery at £73; but the demand is slack. English is offering at £79. Banca has declined to 45 1/2, and Billiton to 43 1/2. **Tin Plates** are in better demand, and recovered fully 1/ per box from the lowest. Prices, however, are still very low. **Lead** has further declined 3/ per ton, and now obtainable at £20 to £20 5/; Spanish, £20. **Spelter** dull and declining; common Silesian, £22 5/ to £22 10/; and specials in outports 5/ to 10/ extra. **Quicksilver** in fair demand at £8 per bottle.

Latest Liverpool prices are:

Iron: f. o. b. in Liverpool, per ton.			
Merchant bar.....	£ s. d.	£ s. d.	£ s. d.
Merchant bar, in Wales.....	6 15 0	6 7 0	6 10 0
Staffordshire.....	6 5 0	6 6 10	6 10 0
Hoop.....	7 7 0	6 9 15	6 10 0
Sheet.....	8 0 0	7 9 0	7 10 0
Nail rod.....	10 0 0	9 11 0	9 10 0
Bar, best crown.....	8 0 0	6 9 0	6 10 0
Boiler plates.....	7 7 0	6 8 10	6 10 0
Boiler plates.....	9 15 0	9 10 10	9 10 0

Tin Plates: f. o. b. in Liverpool, per box.			
Charcoal, I. C.....	£ s. d.	£ s. d.	£ s. d.
Coke, I. C.....	1 4 0	1 6 6	1 6 0
Coke, I. C.....	2 19 0	2 6 1	2 6 0

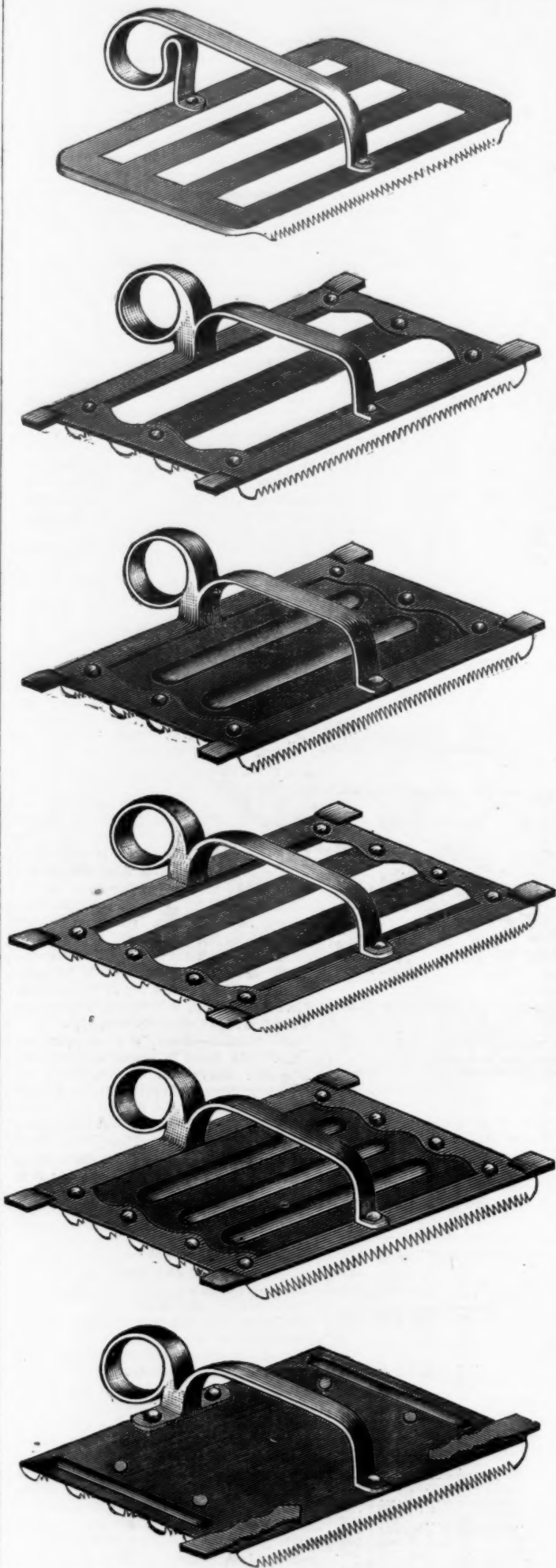
Copper: Delivered in Liverpool, per ton.			
Bolt and Sheathing.....	£ s. d.	£ s. d.	£ s. d.
Tin.....	91 0 0	90 0 0	90 0 0
Tin.....	85 0 0	84 0 0	84 0 0
Tough cake.....	85 0 0	84 0 0	84 0 0
Best selected.....	86 0 0	85 0 0	85 0 0

One of the Smallest Steam Engines in the World.

Among mechanics it is generally conceded that the very small engines, of which we hear now and then, produced by some extremely skillful workman, are of no value, and the labor expended upon them is a mere waste. This view is not altogether a sound one, since a great deal of our modern machinery depends for its success upon a skill of hand equalled only by that required for the production of one of these minute engines. An incident happened the other afternoon in Machinery Hall which the *Philadelphia Press* thinks worth recording. It was certainly an exhibition of wonderful skill in the workman, which should be employed in a useful direction.

While a large throng of visitors from all countries were standing silently around the Corliss engine, watching its movements with feelings partly of delight and partly of awe, a tall, gentlemanly looking personage, who afterward gave his name and address as Levy Taylor, Indianapolis, Ind., joined the crowd. After watching the motions for a few moments, the gentleman passed around to one side, and extracting from his pocket a small tin case, took from it what looked like a diminutive alcohol lamp, and striking a match, started a miniature flame, and placed the contrivance on a corner of the platform which surrounds the mighty steam giant from Rhode Island. At first glance nothing could be discerned over this lamp but a small excrescence, which looked more like a very juvenile humming bird than anything else, but a close inspection showed that what was mistaken for illiputian wings was the fly-wheel of a perfect steam engine, and persons with extra good eyes could, after a close examination, discover some of the other parts of the curious piece of mechanism. This engine has for its foundation a 25 cent gold piece, and many of its parts are so tiny that they cannot be seen without a magnifying glass. It has the regular steam gauge, and, though complete in every particular, the entire apparatus weighs only seven grains, while the engine proper weighs but three grains. It is made of gold, steel and platinum. The fly-wheel is only three-fourths of an inch in diameter; the stroke is one twenty-fourth of an inch, and the cut-off one sixty-fourth of an inch. The machinery, which can all be taken apart, was packed in films of silk. It is to be hoped that this wonderful piece of work is to be placed on exhibition alongside of its grand antithesis, but it is now probably too late to make an entry.

HOTCHKISS' PATENT NOVELTY COMBS.



THIS CUT ILLUSTRATES THE GRASPING OF THE COMB.

Manufactured by

HOTCHKISS' SONS, Bridgeport, Conn.,

These Combs do not infringe upon the rights of any one. They are the Simplest, Neatest and Most Durable CUREY COMBS ever offered to the trade, affording an easy grasp for the hand, without the use of the ordinary side handle, and are universally acknowledged to be superior to all others. They are neatly put up in paper boxes of one dozen each, and packed 24 dozen in a case. Special net prices furnished on application. Sample and Warehouses with GRAHAM & HAINES, 113 Chambers Street, N. Y.

L. COES' Genuine Improved Patent SCREW WRENCHES.

Manufactured by

L. COES & CO.,
Worcester, Mass.



We invite the particular attention of the trade to our New Straight Bar Wrench, widened, full size of the larger part of the so called "reinforced or jog bar." Also our enlarged jaw, made with ribs on the inside, having a full bearing on the front of bar (see sectional view), making the jaw fully equal to any strain the bar may be subjected to.

These recent improvements in combination with the nut inside the ferrule firmly screwed up flush, against square, solid bearings (that cannot be forced out of place by use), verifies our claim that we are manufacturing the strongest Wrench in the market.

We would also call attention to the fact, that in 1869 we made several important improvements (secured by patents), on the old wrench previously manufactured by L. & A. G. Coes which were at once closely imitated and sold as the Genuine Wrench by certain parties who seem to rely upon our improvements to keep up their reputation as manufacturers, and although the fact of their imitating our goods may be good evidence that we manufacture a superior Wrench, we wish the trade may not be deceived on the question of originality. Trusting the trade will fully appreciate our recent efforts, both in improvements on the Wrench and in the adoption of a Trade Mark, we would caution them against imitations. None genuine unless stamped

"L. COES & CO."

Warehouse, 97 Chambers St., & 81 Reade Sts., N. Y.
HORACE DURRIE & CO., Sole Agents.



GOLD MEDAL Non-Extensible Razor Belt.

PATENTED JULY 25, 1871.

RE-ISSUED MAY 13, 1873, and JUNE 9, 1874.

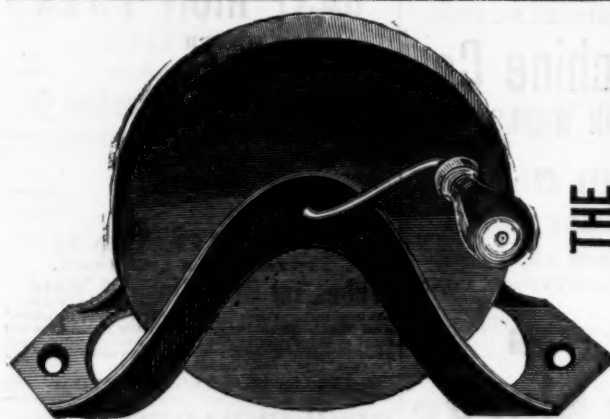
In this Strap the liability of the leather to stretch and become loose and porous is prevented by the use of a patented non-extensible base, which supports the leather and secures

PERMANENT ELASTICITY.

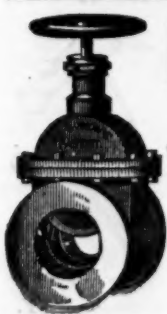
We make this style with single rod, double rod, and wood frames, and intend that it shall, in quality compare favorably with our other well known brands.

BENJAMIN F. BADGER & SON, Manufacturer

Badger Place, Charlestown, Mass.



**THE
FAMILY GRINDSTONE
MFG. CO.,**
NEWARK, N. J.
228 MARKET ST.,
GILBERT PARKER General Agent.

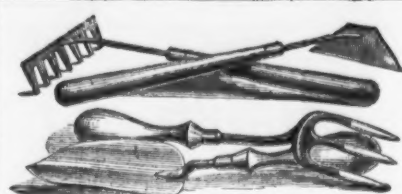


Ludlow Valve Mfg. Co.,
OFFICE AND WORKS:

938 to 954 River St. & 67 to 83 Vail Ave., Troy, N. Y.
VALVES

Double and Single Gate, 1/2 in. to 48 in.—outside and inside Screws, Indicator, &c., for Gas, Water and Steam. Send for Circular.

Also FIRE HYDRANTS,



This set of GARDEN TOOLS, is put up in a nice paper box, and is superior to any other in the market. The tools are made of the best quality of Steel, highly polished, and of malleable iron polished or painted, with birch handles. We will make it an object for every dealer to handle them.

PRICE \$15, PER DOZEN SETS.

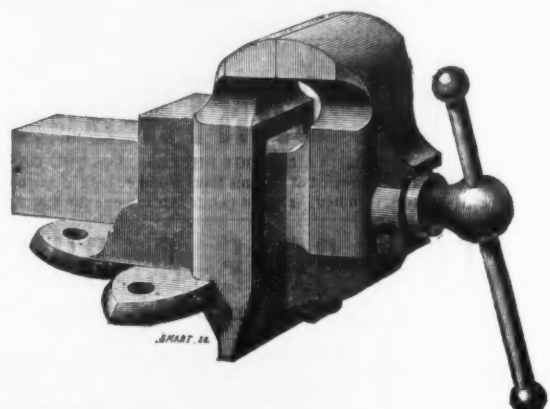
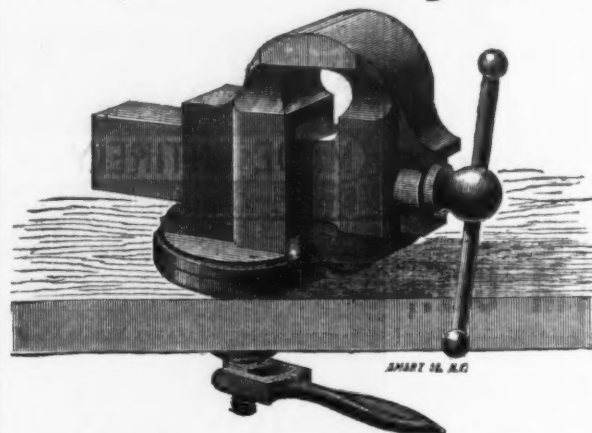
CENTENNIAL CHAIR.

This Chair is made of the best second growth White Ash, finished on the wood, with Brussels Carpet Seat. It shuts up to the size of a single chair post, and weighs only one pound. Every person who forgets to take one with him when he goes to the Centennial, will be sorry when he gets there, as no chairs are provided for visitors, and they get very tired. Every store in the land can sell a few of them at a profit. They are a very popular article here.

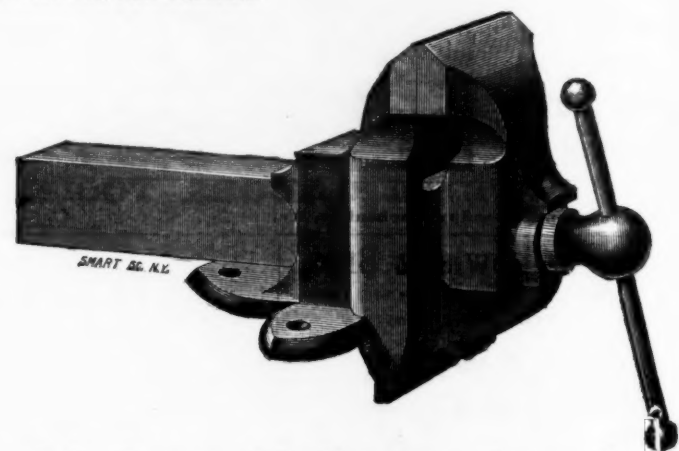
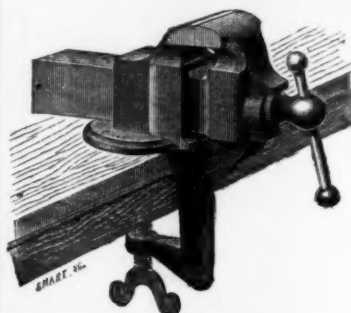
PRICE, \$12 PER DOZEN.

MILLERS FALLS CO., 74 Chambers St., N. Y.
Corner BROADWAY.

Simpson's Adjustable Parallel Vises.



The Jaws can be instantly opened or closed the full length, by one movement of the hand, without the use of the screw. They combine the QUICK ADJUSTMENT with all the advantages of the best Screw Vises, holding the work with as slight or firm a grip as may be desired, without any liability to jar or work loose, as is the case with other adjustable vises. The Screw being used merely to give the grip, they will outwear any Vises in market.

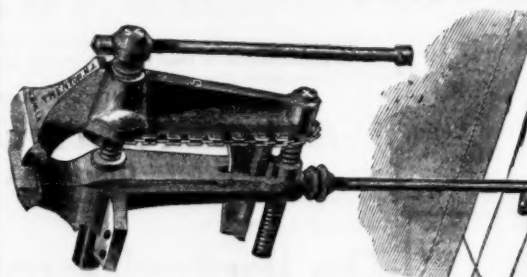


Their extreme simplicity constitutes one of their strongest recommendations.

Send for Price List.

BAILEY WRINGING MACHINE CO., Sole Agents, 99 Chambers Street, N. Y.

The New Double Screw Parallel "Leg" Vise.



We are now ready to furnish, as the result of more than thirty years' experience, our latest style of Vise—the best yet made. It is stronger than any other, whether of Foreign or of American make; always parallel and holding with a tighter "grip." The jaws are of convenient shape for the workman to get near his work equally well for filing or chipping. Instead of the heavy, clumsily formed jaws of the cast-iron Single Screw Vises of the common "parallel" type, and which, depending upon slide alone for preserving parallelism, can never be screwed up very hard without "jamming" on the slides or breaking.

Our New Vise combines all the advantages of the "Peter Wright" Leg Vise, of strength and lightness, fastening to the floor and bench, and at the same time greatly superior to it: it is always perfectly parallel at all points of opening, and never gets out of line. Embodying the same general principle as the well-known Chain Vise, so long made by us, we have by new scientific proportioning of all the parts, and with our recently improved metals for their manufacture, obtained so perfect a tool, that we now warrant these Vises for three years from date of manufacture stamped upon each.

The Jaws are of best Tool Cast Steel, welded on, file cut and properly hardened. The screws are forged of the best refined iron, and work in solid cut thread boxes.

The lower screw maintains the parallel position of the two jaws, by having exact motion with the upper working screw through the connecting chain which regulates it. The chain is very accurately made of steved links and rivets, and having no strain of the work upon it, is therefore as durable as all the other parts.

Prices with Special Discounts to the Trade.

No.	Jaws	3 1/2 in. x 1 1/2 in.	Screws	1/2 in. diameter.	Lever	9 in. long.	Opens	4 1/2 in.	Price
1	"	4 1/2 in. x 1 1/2 in.	"	1 1/2 in.	"	13 in.	"	5 1/2 in.	\$8 00
2	"	5 1/2 in. x 1 1/2 in.	"	1 1/2 in.	"	16 in.	"	6 1/2 in.	12 00
3	"	6 1/2 in. x 1 1/2 in.	"	1 1/2 in.	"	19 in.	"	7 1/2 in.	17 00
4	"	7 1/2 in. x 1 1/2 in.	"	1 1/2 in.	"	24 in.	"	8 1/2 in.	22 00
5	"	8 1/2 in. x 1 1/2 in.	"	1 1/2 in.	"	28 in.	"	9 1/2 in.	30 00
6	"	9 1/2 in. x 1 1/2 in.	"	1 1/2 in.	"	32 in.	"	10 1/2 in.	38 00

All sizes of these Vises furnished with Swivel Attachment, at an additional cost of \$1 to \$2. Sold at the General Agencies.

THESE GOODS ARE SOLD BY THE GENERAL AGENTS (with special discounts to the trade)

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HOWARD PARALLEL BENCH VISE.
MANUFACTURED BY
Howard Iron Works,
Send for price list. **Buffalo, N. Y.**
RUSSELL & ERWIN MFG. CO. NEW YORK & PHILADELPHIA AGENTS.

The New Ballard Rifle.



Hunting, Short and Long Range Target Rifles.
SEND FOR PRICE LIST.

SCHOVERLING & DALY,
84 & 86 Chambers St., New York.

Standard O. K., F. & W. Double Action, Wesson & Harrington new line
Revolvers. Send for Reduced Price List.

ESTABLISHED 1823.

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Sole Agents in the United States for FOREHAND & WADSWORTH'S NEW MODEL SWAMP ANGEL
and other Revolvers.

CREEDMOOR SEVEN SHOT NICKEL PLATED, The Cheapest Revolver made.
CREEDMOOR, 32-100 REVOLVERS.

COLT'S New Line, 22-100, 30-100, 32-100, 38-100, 41-100.

COLT'S ARMY REVOLVER 45-100, adopted by Texas, the United States, and other
governments. CENTENNIAL REVOLVERS, 22-100, 32-100, 38-100, 41-100.

SHELLS, WADS, CAPS, GUNS, &c., in the largest quantities. Special inducements to large buyers.
JOB LOT OF SWAMP ANGEL DERRINGERS.

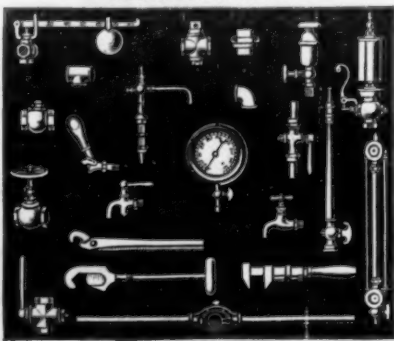
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ELEY'S CARTRIDGE SHELLS.

ELEY'S NEW "STAR" CARTRIDGE SHELLS. Also THE GASTIGHT BLUE AND BROWN
SHELLS can be procured of all Gun Makers and dealers in Ammunition in the United States.
ELEY BROS. (Limited) have not granted to any one the Exclusive sale of these Shells.

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Wrought Iron
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Cast Iron
FLANGED PIPE,
Cast Iron
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Brass & Iron
STEAM
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MATERIALS.

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TRADE MARK.
MANUFACTURERS OF
PURE WHITE LEAD, RED LEAD,
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Linseed Oil
AND PAINTERS' COLORS.



The Atlantic White Lead and Lin-
seed Oil Company,

MANUFACTURERS OF
White Lead (Atlantic), Red Lead,
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ROBERT COLGATE & CO.,
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Established A. D., 1777.

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Offices, 31st St. below Chestnut, PHILADELPHIA.

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WHITE LEAD.



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Also Manufacturers of
LINSEED OIL
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MANUFACTURERS OF

BRASS COCKS

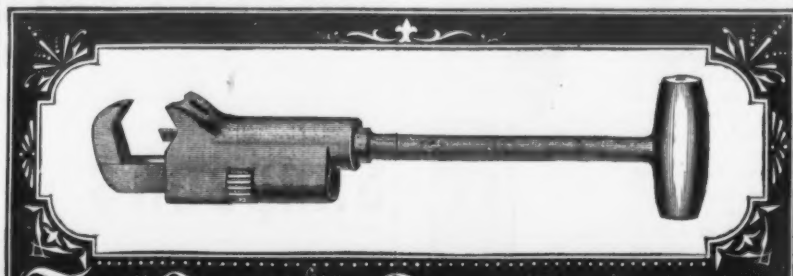
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The Acme Pipe Cutter.

MADE ENTIRELY OF SOLID CAST STEEL

Cuts Wrought Iron, Brass and Copper Pipes,
Round Iron &c perfectly true without leaving
burr on pipe, contracting or splitting it. Cuts
out a chip similar to a lathe tool. The knife
may be removed and ground. Send for descriptive
circular to manufacturers.

Pancoast & Maule
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MINERS, DEALERS AND EXPORTERS OF HIGH TEST

Crystallized Black and Gray Oxides of
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Ground, granulated and especially prepared to suit all branches of the home trade.
Warranted to contain from 70 to 90 per cent. peroxide of manganese, and to give satisfaction with re-
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PUMPING ENGINES, for City and Town Supply, a Specialty.

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Differential Pulley Blocks

Also known as

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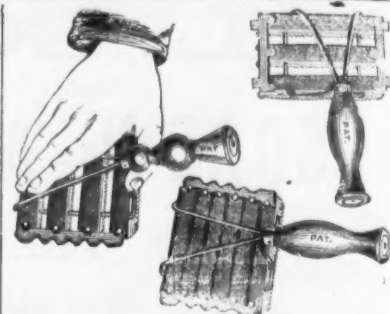
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VAN WART & MCCOY, New York Agents, 134 & 136 Duane Street.

T. A. WESTON, Mechanical Engineer, with the Company.



The Perfect Comb.

We call your attention specially to our new patent and
less wire frame comb. The result of a long series of ex-
periments, made with a view to meeting all the requi-
sitions of a Perfect Comb. It is better, stronger, and
more durable than any ever before invented. The ruled
wire shank gives what has never before been attained,
viz: a rest and brace for the thumb, in such a position
that the hand cannot come in contact with the horse
while using the comb. The wire braces which run from
the shank over the back to the front teeth give strength
and durability in a direction never heretofore attained,
and at the same time serve as an extra handle; and
when clasped by the fingers in connection with the ruled
shank the comb is more firmly held, and completely
possible in any other formation—in short, it needs but a
trial to vindicate its name: The Perfect Comb.

THE LAWRENCE COMB CO.

Factory and Office,

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Sole Manu-
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PATENT
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PUMPS, CABINET WOOD WORK, &c.

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WHEATCROFT'S SELF-ADJUSTING



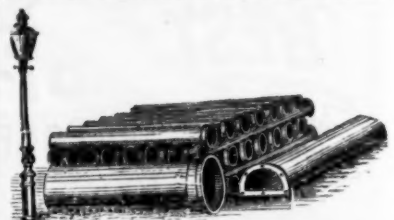
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Scripture's Funnel Top
MACHINE OILERS.

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CAST IRON PIPES

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Tubes for Gas, Steam & Water

1-16 to 48 inch. Gas, Steam Fitters', Plumbers'
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work for Cars, Bridges and Buildings.

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GEORGE BARNES & CO.,



Manufacturers, Syracuse, N. Y.

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Newcomb Bros., 586 Water, N. Y.	7
Scott Geo. M., Chicago, Ill.	7
Bells.	
Baltimore Bell and Brass Works, 53 and 55 Hol-	
iday, Baltimore, Md.	12
Williams E. A. & Son, 315 Broadway, New York,	
N. Y.	2
Bells (Sleigh).	
Beyn Bros. Mfg. Co., Easthampton, Conn.	16
Blind Hinges.	
The Holbrook Patent Blind Hinge Mfg. Co., Water-	
town, N. Y.	6
Belting, Leather, Manufacturers of.	
Alexander Bros., 412 N. 3d, Warren, N. Y.	33
Amy Charles W., 148 N. 3d, Phila.	33
Forehand Wm. F. Jr. & Bros., Phila.	35
Bird Lages, Manufacturers of.	
Lindom R. L., 24 Pearl, N. Y.	3
Maxheimer John, 249 Pearl, N. Y.	10
Osborn Mfg. Co., 79 Bleeker, N. Y.	10
Blit Braces, Manufacturers of.	
Molter & Sons, 11 Chambers, N. Y.	25
Blowers, Manufacturers of.	
Keystone Portable Forge Co., Philadelphia.	33
Bolt Machines, Manufacturers of.	
Forrest S. C. & Co.	38
Bolt Screws.	
Samuel Hall's Son & Co., 229 W. 10th, N. Y.	11
Borax.	
Pfizer Chas. & Co., New York.	6
Brass Butts, Manufacturers of.	
Tobson W. J. & Co., 14 Pearl, N. Y.	6
Brass, Manufacturers of.	
Anso's Brass and Copper Co., 19 Cliff, N. Y.	2
Baltimore Bell and Brass Works, 53 and 55 Hol-	
iday, Baltimore, Md.	12
Benedict & Yose, 99 Chambers, N. Y.	2
David John & Sons, 100 John, N. Y.	2
Holmes, Booth & Co., 100 Chambers, N. Y.	2
Hickox Mfg. Co., 230 Pearl, N. Y.	2
Manhattan Brass Co., 31 Reade, N. Y.	2
Miller Edw. & Co., 14 Chambers, N. Y.	2
Plume & Atwood Mfg. Co., 30 Chambers, N. Y.	2
Sevill Mfg. Co., 42 Broome, N. Y.	2
The Wilcox Mfg. Co., 14 Chambers, N. Y.	2
Bridgeport, Conn.	2
Waterbury Brass Co., 52 Beekman, N. Y.	2
Brick Presses, Manufacturers of.	
Carnell F. L. & D. R., 184 Germantown Ave., Phila.	28
Schantz Nathan, Perth Amboy, N. J.	28
Bridge Builders, Manufacturers of.	
Mosley Iron Bridge and Roof Co., 5 Day, N. Y.	10
Leighton Bridge and Iron Works, Rochester, N. Y.	10
Brushes (Wash).	
Freder P. M., 117 John, N. Y.	11
Butcher and Shoe Knives, Manufacturers of.	
Wilson John, Sheffield, England.	38
Butts and Hinges, Manufacturers of.	
American Spiral Spring Bolt Co., 82 Beekman, N. Y.	40
Temple, Birge & Co., Phila.	40
Union Mfg. Co., 91 Chambers, N. Y.	40
Carriage Bolts, Manufacturers of.	
Townsend, Wilson & Hubbard, Phila.	12
Carriage Bolt Works, 100 Chambers, N. Y.	12
Smith H. D. & Co., Plantville, Ct.	18
Car Wheel, etc., Manufacturers of.	
Taylor Iron Works, 100 Chambers, N. Y.	4
Casters, (Furniture).	
Toler John, Sons & Co., Newark, N. J.	40
Cheney & Co., 100 Chambers, N. Y.	40
Hall & Harbison, 101 Greenwich, N. Y.	40
Chisels, Manufacturers of.	
Buck Bros., Millers, Mass.	3
Coal, Miners of.	
Lehigh Valley Coal Co., 609 Courtland and Church,	
N. Y.	31
Pardee A. & Co., 111 Broadway, N. Y.	31
Coal Vases.	
Joett John C. & Sons, Buffalo, N. Y.	31
Sidney Shepard & Co., Buffalo, N. Y.	31
Coal Hoists, Manufacturers of.	
Eastbrook Wm., 81 Cherry, Phila.	16
Jewett John C. & Sons, Buffalo, N. Y.	31
Coarse and Spice Mills.	
Lane Brothers, Millers, N. Y.	4
Enterprise Mfg. Co., Philadelphia, Pa.	4
Compasses and Dividers, Manufacturers of.	
Bemis & Call Hardw. & Tool Co., Springfield, Mass.	12
Compound.	
Hornbostel Chas., 56 Broadway, N. Y.	26
Nichols H. & Co., 80 Maiden Lane, N. Y.	12
Copper's Tools, etc., Dealers in.	
D. R. Barton Tool Co., Rochester, N. Y.	10
Little Chas., 59 Fulton, N. Y.	23
Corn Husks.	
Chambers & Quinlan, Decatur, Ill.	16
Corrugated Iron.	
Mosley Iron Bridge and Roof Co., 5 Day, N. Y.	10
Cotton Gin Feeders, Manufacturers of.	
The Brown Cotton Gin Co., New London, Conn.	38
Cranes, Manufacturers of.	
Stow, Wile & Co., 709 Market, Phila.	33
C. Saws and Razors.	
Greene Levi & Sons, Mass.	16
Curry Combs, Manufacturers of.	
Cass I. N., Fredericktown, O.	27
Fauer Brothers, 29 Chambers, N. Y.	27
Hotchkiss' Sons, Bridgeport, Conn.	24
Lawrence Curry Comb Co., 384 3d Avenue, N. Y.	24
Cutlery, Importers of.	
Baker Hermann & Co., 101 Duane, N. Y.	23
Clatworthy F. & W., 58 Chambers, N. Y.	23
Huber Jos. E., 100 Chambers, N. Y.	23
Friedman & Luterling, 14 Warren, N. Y.	11
King, J. & Co., 80 Chambers, N. Y.	11
Max Funnell, 100 Chambers, N. Y.	11
Rosen & Bro., 203 Broadway, N. Y.	11
Ward Ashline, 101 Duane, N. Y.	11
Wilson Hawkins, 100 Chambers, N. Y.	11
Cutlery, Manufacturers of.	
Burkhead Aaron, Pepperell, Mass.	31
Lamson & Goodnow, 100 Chambers, N. Y.	31
Menden Cutlery Co., 49 Chambers, N. Y.	11
Miller Bros. Cutlery Co., W. Meriden, Conn.	11
Nauvut Cutlery Co., 49 Chambers, N. Y.	11
New York Knife Co., Walden, N. Y.	11
Deg Muzzles.	
Kennedy J. W. T., 60 Duane, N. Y.	12
Door Alarm, Manufacturers of.	
B. Blakemore, 315 Market, Philadelphia.	10
Door and Gate Springs, Manufacturers of.	
Quackenbush, Townsend & Co., 99 Reade, N. Y.	34
Van Wagener & Williams, 82 Beekman, N. Y.	34
Door Knobs.	
Ornamental Wood Co., Bridgeport, Conn.	14
The Parker & Whitely Co., 91 Chambers, N. Y.	14
Dredging, Manufacturers of.	
The Hartford Dredge Co., 291 Broadway, N. Y.	23
Dredging, and Makers of Dredging Machines.	
Lim, Dredging Co., 178 Delaware Ave., Phila.	33
Drill Chucks, Manufacturers of.	
Fraser & Co., 81 Chatham, N. Y.	33
Lambertville Iron Works, Lambertville, N. J.	33
Drilling Machines, Manufacturers of.	
Thorne, DeHaven & Co., Philadelphia.	38
Drop Forgings.	
Billings & Spencer Co., Hartford, Conn.	37
Baker Hermann & Co., 101 and 103 Duane, N. Y.	37
Hammill B. & Co., Hartford, Conn.	37
The Hall & Belden Co., Danbury, Conn.	37
Edge Tools, Manufacturers of.	
The D. R. Barton Tool Co., Rochester, N. Y.	10
Weed S. A. & Gold, N. Y.	10
Elevators, Manufacturers of.	
Crane Bros. Mfg. Co., Chicago, Ill.	9
Holts Machine Co., 279 Cherry, N. Y.	9
Whittier Machine Co., 1176 Tremont, Boston, Mass.	38
Emery.	
Geo. H. Gray & Danforth, Boston, Mass.	33
The Union Stone Co., Exchange, Boston.	33
Emery Wheels, Manufacturers of.	
Brady Mfg. Co., 241 Plymouth, Brooklyn, N. Y.	33
The Union Stone Co., Exchange, Boston.	33
Enamelled Plates.	
Lefferts Enamel Works, 411 W. 34, N. Y.	4
Engineers, Manufacturers of.	
Hessell James, 1056 Beach, Phila.	15
Moore James, 1056 and 1058 Broadway, Phila.	15
Chl & Hauschild, 51 to 61 Passaic Ave., E. Newark,	
N. J.	38
Equine, Steam, Manufacturers of.	
Erwin Chas. W. & Bro., Kensington, Phila.	26
Hartford Foundry and Machine Co., Hartford, Ct.	26
Lovgrove & Co., 121 South 4th, Phila.	26
Payne B. W. & Sons, Corning, N. Y.	26
Stanley & Wells, Birmingham, N. Y.	26
Engravers.	
Collins Geo. B., 10 Warren, N. Y.	4
Swinton A., 722 Chestnut, Phila.	4
Encaustic, Brass, Manufacturers of.	
McNab & Hartin Mfg. Co., 56 John, N. Y.	36

Encaustic, Self-Measuring, Makers of.	
Enterprise Mfg. Co., of Pa., Phila. and N. Y.	34
Files, Importers of.	
Car J. & Riley 82 John, N. Y.	33
Finer Joseph S., 411 Commerce, Phila.	11
Fraser Peter A. & Co., 36 Fulton, N. Y.	11
Moss F. W., 80 John, N. Y.	33
Sanderson Bros. & Co., 16 Cliff, N. Y.	33
Spicer & Jackson, 52 Chambers, N. Y.	33
Files, Manufacturers of.	
Adamantine File Works, Providence, R. I.	13
American File Co., Pawtucket, R. I.	13
Augustine File Works, 58 Chambers, N. Y.	13
Barnett G. & H., 41 and 43 Richmond, Phila.	8
Denton Henry & Sons, Phila.	29
Draper C. F. & Co., Sing Sing, N. Y.	8
Heller & Bros., Newark, N. J.	8
Hiscox File Mfg. Co., West Chelmsford, Mass.	8
Johnson & Bro., 1 Commercial, Newark, N. J.	8
McClaffey & Bro., 1732 and 1734 N. 4th, Phila.	8
Nicholson File Co., Providence, R. I.	24
Paul Chas. B., Williamsburgh, N. Y.	8
Fire Bricks, Makers of.	
Ames Chas. & Sons, Woodbridge, N. J.	28
Berry Wm. H. & Co., Woodbridge, N. J.	28
Brooklyn Clay Retort and Fire Brick Works, Van Dyke St., Brooklyn, N. Y.	28
Hall A. & Sons, Perth Amboy, N. J.	28
Hart A. & Sons, Buffalo, N. Y.	28
Kreacher H. & Son, 54 Goerck, N. Y.	28
Newkumet Philip, 23d and Vine, Phila.	28
Newton & Co., Albany, N. Y.	28
Reynolds & Co., 100 Chambers, N. Y.	28
Valentine M. D. & Bro., Woodbridge, N. J.	28
Watson John R., Perth Amboy, N. J.	28
Weber Adam, 163 E. 19th, N. Y.	28
Woodland Fire Brick Co., Woodland, Pa.	28
Flint and Emery Paper and Cloth.	
Baer, Adamson & Co., 780 Market, Phila.	38
Fishing Tackle.	
Shipley A. B. & Son, 503 Commerce, Phila.	38
Fire Engines, Makers of.	
The Chalmers Engine Co., foot of E. 9th, N. Y.	36
Fluting Machines.	
The American Machine Co., 430 Walnut, Phila.	38
Forges, Portable, etc.	
Keystone Portable Forge Co., Philadelphia.	33
Place George, (Hurricane) 121 Chambers, N. Y.	9
Founders and Machinists.	
Sam J. Cresswell Jr., 812 Race, Phila., Pa.	6
Foundry Factories.	
Cutler & Brown, 285 Cherry, N. Y.	4
Faxon J. W. & Co., 514 Beach, Phila.	4
Whitehead Bros., 517 W. 15th, N. Y.	4
Fracture Trimmings.	
Patterson J. M., Woodbury, N. J.	4
Furnaces, Makers of.	
Richmond & Potts, 119 S. Fourth, Phila., Pa.	4
Greider, 100 Chambers, N. Y.	4
Lefferts Marshall Jr., 90 Beekman, N. Y.	4
Gang Belts, etc.	
Edw. Sweeney, 4 Duane, N. Y.	4
Governors.	
Junius Judson & Son, Rochester, N. Y.	38
Shive Governor Co., Bethlehem, Pa.	38
Grate Bars.	
Andershit Geo., foot W. 13, N. Y.	38
Grate Cradles and Stands, etc.	
Semple, Birge & Co., St. Louis, Mo.	38
Grindstones.	
Forster Gilbert, 225 Market, N. Y.	38
Wood Walter R., 283 and 285 Front, N. Y.	38
Worthington & Sons, North Amherst, O.	38
Groves, etc.	
Moore's John P. Sons, 300 Broadway, N. Y.	26
Schroeder & Day, 41 Chamber St., N. Y.	26
Windmiller Louis & Roelker, 20 Reade, N. Y.	26
Gumdrop, etc., Manufacturers of.	
Kneeland F. L. (Dupont) 70 Wall, N. Y.	38
Adin & Grant Foundry Co., New York, N. Y.	38
Hammers, etc., Manufacturers of.	
Emmet Hammer Co., Brooklyn, E. D., N. Y.	13
Hammond H. H., 100 Chambers, N. Y.	13
Handles, Makers of.	
N. Carolina Handle Co., 79 Reade, N. Y.	5
Greenboro' Handle Works, 108 Chambers, N. Y.	5
Semple, Birge & Co., St. Louis, Mo.	5
Hardware Commission Merchants.	
Gram & Haines, 113 Chambers, N. Y.	38
Peck G. Webster, 110 Chambers, N. Y.	38
Wilson J. Clark & Co., 81 Beekman, N. Y.	38
Hardware Dealers.	
Belt & Burger, 98 Chambers, N. Y.	38
Deane & Walton, 625 Market, Phila.	38
Quackenbush, Townsend & Co., 99 Reade, N. Y.	34
Shepard Sidney & Co., Buffalo, N. Y.	31
Wilson J. Clark & Co., 81 Beekman, N. Y.	38
Hardware Importers.	
Baker Hermann & Co., 101 Duane, N. Y.	38
Cine, Birge & Co., 80 Chambers, N. Y.	38
Van Wart & McCoy, 134 and 136 Duane, N. Y.	11
Hartford F. W., 76 Chambers, N. Y.	11
Windmiller Louis & Roelker, N. Y.	38
Hardware Manufacturers.	
American Spiral Spring Bolt Co., 82 Beekman, N. Y.	40
Blake Bros. Hardware Co., Newark, N. J.	40
Riglin Philip S., 91 Reade, N. Y.	12
Clark & Co., Buffalo, N. Y.	31
Cowles Hardware Co., Unionville, Ct.	31
Enterprise Mfg. Co., Phila.	34
Greene Levi & Sons, Mass.	16
Middletown Tool Co., 18 & 20 Cliff, N. Y.	34
Miller & Fells Mfg. Co., 74 Chambers, N. Y.	34
Par Geo., Buffalo, N. Y.	31
Pratt & Co., Buffalo, N. Y.	31
Providence Tool Co., Providence, R. I.	13
Sperry Davis & Co., Balaia, N. Y.	13
The Hall & Belden Co., Danbury, Conn.	37
Union Mfg. Co., 91 Chambers, N. Y.	40
Wilson Mfg. Co., 91 Chambers, N. Y.	40
Hardware Specialties.	
Baron, 280 Chambers, N. Y.	5
Goodnow & Wightman, 23 Cornhill, Boston.	28
Grant & Co., Newark, N. J.	28
Hardy & Co., 102 Elm, N. Y.	28
Jessup & Sterling, 1 and 9 Cliff, N. Y.	1
Langdon Mfg. Co., 100 Chambers, N. Y.	1
Semple, Birge & Co., St. Louis, Mo.	38
Shepard Sidney & Co., Buffalo, N. Y.	31
Spencer & Underhill, 11 Beekman, N. Y.	2
Heat-Resisting Engines, Manufacturers of.	
Crane Bros. Mfg. Co., Chicago, Ill.	9
Osby Bros. & Co., 345 Broadway, N. Y.	9
Hog Rings.	
Chambers & Quinlan, Decatur, Ill.	16
Horse Nails, Makers of.	
Amable Horse Nail Co., 25 Chambers, N. Y.	37
Globe Nail Co., Boston, Mass.	37
Platt & Co., Buffalo, N. Y.	37
Smith & Co., Buffalo, N. Y.	37
Horse Shoes, Makers of.	
Boston Rolling Mills, 11 Battery March, Boston.	4
Gordon Iron Works, Troy, N. Y.	4
Rhode Island Horse Shoe Co., Providence, R. I.	4
Schoenberger & Co., Pittsburgh, Pa.	4
Hydraulic Jacks.	
Dudgen Richard, 31 Columbia, N. Y.	39
Ice Chisels.	
Blanchard & Co., 54 Beekman, N. Y.	6
Ice Cream Freezers.	
Blanchard & Co., 54 Beekman, Phila.	6
Insurance, Broker.	
Hartford Steam Boiler Inspection and Insurance Co.	39
Iron Brokers.	
Raymond Geo., 70 Wall, N. Y.	4
Crane U. O., 101 John, N. Y.	4
Hart A. G., Pittsburgh, Pa.	4
Howard D. D., 24 Pearl, N. Y.	4
Smith W. Minor, 95 Beaver, N. Y.	4
Iron Bridges.	
Leighton Bridge and Iron Works, Rochester, N. Y.	10
Iron Charcoal, Warm or Cold Blast.	
Quincy John W., 35 William, N. Y.	4
Iron Corroborated Merchants.	
Brown T. Horace, 205 Walnut, Phila.	5
Hand Jas. C. & Co., 615 and 616 Market, Phila.	5
Spencer & Underhill, 11 Beekman, N. Y.	2
Iron, Pig, Importers of.	
Williamson James & Co., 69 Wall, N. Y.	4
Iron Pig, Manufacturers of.	
Parrott Peter P., Greenwood Fee, Orange Co., N. Y.	4
Iron, Pig, Manufacturers of.	
Abel Brothers, 190 South, N. Y.	4
Bonell, Botsford & Co., Youngstown, O.	4
Borden & Lovell, 70 and 71 West, N. Y.	4
Cleveland, Brown & Co., Cleveland, O.	4
Cooney Daniel F., 83 Washington, N. Y.	4
Hunsell G. C., 99 Market St., N. Y.	4
Fuller, 100 Chambers, N. Y.	4
Fuller, Dana & Fitz, 110 North, Boston.	4
Harrison & Gilson, 555 to 562 Water, N. Y.	4
Jackson & Chase, 28 Chambers, N. Y.	4
Judson B. F., 45 and 459 Water, N. Y.	4
Osgen Wallace, 55, 513 and 511 Elm, N. Y.	4
Pierston & Co., 55 William, N. Y.	4
Quincy John W., 35 William, N. Y.	4
Reed John H. & Co., 35 William, N. Y.	4
Renards D. W. & Co., 35 Mangan St., N. Y.	4
Sander Jas., Richmond, Va.	4
Wallace Wm. H. & Co., Albany and Washington streets, N. Y.	4
Ward John, 24 Pearl, N. Y.	4
Williamson James & Co., 69 Wall, N. Y.	4
Whitney A. R. & Bro., 55 Hudson, N. Y.	4
Iron, Manufacturers of.	
Bradley, Rele & Co., 22 Cliff, N. Y.	4
Burden Iron Works, Troy, N. Y.	4
Cleveland Rolling Mill Co., Cleveland, O.	4
Com Wm. E. & Co., 8 Oliver, Boston.	4
Boston Rolling Mills, 17 Battery March, Boston.	4
Everson, Macrum & Co., Pittsburgh, Pa.	4
J. & J. Rogers Iron Co., Assam's Forks, N. Y.	4
Leonard John, 45 and 46 West, N. Y.	4
Merritt Iron Co., 100 Chambers, N. Y.	4
Noblit & Bro., Germantown Junction, Phila.	4
Ou Dominion Iron & Nail Works Co., Richmond, Va.	4
Oxford Iron Co., 81 Washington, N. Y.	4
Phillips, Nimick & Co., Pittsburgh, Pa.	4
Phoenix Iron Co., 410 Walnut, Phila.	4
Sander Jas., Richmond, Va.	4
Schoenberger & Co., Pittsburgh, Pa.	4
Iron, Planished Sheet, Manufacturers of.	
Ward John, 24 Pearl, N. Y.	4
Iron Pipe (Tin Lined).	
Tatham & Bros., 25 Beekman, N. Y.	5
Iron, Swedish, Importers of.	
Fuller, Dana & Fitz, Boston, Mass.	4
Mittander Nils, 69 William, N. Y.	4
Iron, Tapers.	
Stevens & McLean, 28 Monroe, N. Y.	38
Keys and Cutters, Manufacturers of.	
Barnes Geo. & Co., Syracuse, N. Y.	36

Knives, Manufacturers of.	
Dieter, H. E., (Tubular) 54 and 56 Fulton, N. Y.	40
Howard & Morse 45 Fulton, N. Y.	40
Lead Pipe, etc., Manufacturers of.	
Havley, Farrell & Co., Pittsburgh, Pa.	2
Lead (Shot and Bar).	
Spillhaug & Co., 141 Walnut, Phila.	35
Levels.	
Dixon Hengg & Sons, Phila.	29
Freudman W. 4 Cedar, N. Y.	2
Locks, Manufacturers of.	
Bonhann Wilson, Broadway and Kosuth, Brooklyn, E. D.	1
Romer & Co., Newark, N. J.	8
Union Nut Co., 75 Hamilton, Phila.	3
Lock Mfg. Co., 228 Broadway, N. Y.	26
Machinery, Makers of.	
Bliss & Williams, 167 Plymouth, Brooklyn.	36
Boone W. C., 18 Humboldt, Brooklyn, E. D.	12
Hendey Machine Co., Wicottsville, Ct.	28
Pratt & Whitney Co., Hartford, Conn.	38
Turners, H. C., 167 Hamilton, Phila.	3
Teasdale A. W., 416 Locust, Phila., Pa.	2
The Hull & Belden Co., Danbury, Conn.	38
Thurall Robert & Co., Chester, Pa.	39
Machinery, Makers of.	
Boone W. C., 18 Humboldt, Brooklyn, E. D.	12
Berens C., Elizabeth, N. J.	13
Lyons & Fellows Mfg. Co., Wicottsville, Ct.	28
Metal Blasts, Tools, Makers of.	
Blaisdell P. & Co., Worcester, Mass.	34
Bauser, 125 North 10th, Phila.	3
Haugen C. & Co., Phila.	59
Metal Blasts.	
Hardman James Jr., 71 John, N. Y.	1
Metallic Articles, Makers of.	
James & Co., Bradford, Ct.	1
Match Safe.	
Evans Price, 688 Greenwich, N. Y.	9
Measuring Tapes.	
Eddy Geo M & Co., 353 Casson Ave., Brooklyn, N. Y.	7
Mallets.	
Wheindie & Mallet Works, 456 E. Houston.	36
Manganese.	
Pyrolutite Manganese Co., 214 Park, N. Y.	16
Metal Dealers and Brakers.	
Trane C. O., 124 John, N. Y.	2
Fuller, Dana & Fitz, Boston, Mass.	2
Grege H. L. C., 108 Walnut, Phila.	2
W. J. Hammond, Pittsburgh, Pa.	2
Peters, Dodge & Co., Cliff, Bk. John & Fulton, N. Y.	2
Purdy Iron Works, Burlington, Iowa.	23
Quincy J. W., 35 William, N. Y.	2
Green Frank & Co., 72, 74 & 76 Lake Chicago.	8
Metals.	
Brettton A. Budget 339 Walnut Phila.	6
Wallace & Humbley, 73 Walnut, Phila.	3
Metals, Anti-Friction.	
Johnson B. W. & Co., 162 and 162 Center, N. Y.	40
Blin's Smelting Works, Williamsburg, N. Y.	2
"Standard" Metal Co., 21 New Chambers, N. Y.	2
Metals Perforated.	
Boyes G. 80 West 4th, N. Y.	2
Metal Roofing.	
Hilecock Mfg. Co., 280 Park, N. Y.	4
Metal Chopping Machinery.	
Balliey Wrigging Machine Co., 106 Chambers, N. Y.	23
Muslin's Candles, Makers of.	
James Boyds & Sons, 10 and 14 Franklin, N. Y.	13
Mining Spikes.	
Emmeryberg Gren. D., Potteryville, Pa.	2
Molders.	
Carter H. 290 Park, N. Y.	10
Moss Traps, Intemperate, Makers of.	
Smith R. E., 50 and 56 Fulton, N. Y.	2
Nails.	
Schoenberger & Co., Pittsburgh, Pa.	2
Nail Pullers.	
Maltby, Curtle & Co., 31 Read, N. Y.	30
Nickel Plates.	
Continental Nickel Plating Works, 47 Ann, N. Y.	2
Hartman John, 504 N. Seventh, Philadelphia.	2
Nickel Plating Co., 133 West 23d, N. Y.	2
Owen S. S. & Co., 121 E. 13, N. Y.	2
Wicks & Co., 73 First st., Brooklyn, E. D., N. Y.	2
Wilder & Co., 114 Fulton, N. Y.	2
Rowland Wm. & Harvey, Frankford, Phila.	4
Note Broker.	
Bainbridge W. 3 and 5 Wall, N. Y.	2
Nuts, Bolts, etc., Makers of.	
Cark W. & Co., Middlesex, Conn.	1
Haskell W. H. & Co., Pawtucket, R. I.	1
Lewis, Oliver & Phillips, Pittsburgh, Pa.	1
Russell, Birdsal & Ward, Port Chester, N. Y.	4
Shelton Co., Birmingham, Conn.	3
Sturges R. H., Reading, Pa.	3
Union Nut & Bolt Co., New Britain, N. Y.	1
Oil Cook Stoves.	
Cleaver Brothers, 1811 William, N. Y.	1
Oil Lubricating, Makers of.	
American Natural Oil Co., 26 Cedar, N. Y.	1
Old Iron, etc.	
Allen A. T. & Co., 108 Walnut, Philadelphia.	1
Ore Crushers.	
Greene & Truher, New Haven, Ct.	3
Paints and Varnishes, Dealers in.	
Devos F. W. & Co., 117 Fulton, N. Y.	1
Pans, (Dripping and Bread.)	
Pharis, Daniel & Co., Pittsburgh, Pa.	1
Patent Solicitors.	
A. V. Brislen, 228 Broadway, N. Y.	2
Humm & Son, Phila. and Washington, D. C.	2
Munson & Co., Scientific American 57 Park Row N. Y.	3
Pipes, Fittings, etc., Makers of.	
Eaton, Cole & Burnham Co., 55 John, N. Y.	2
Pancost & Maule, 222 Pear, Phila.	1
Pipe, Water and Gas, Makers of.	
Leitch Bridge and Iron Works, Rochester, N. Y.	1
McNeil John & Sons, Burlington, N. J.	1
Wood R. D. & Co., 400 Chesnut, Phila.	3
Plane Irons, Manufacturers of.	
D. R. Barton Tool Co., Rochester, N. Y.	2
Middletown Tool Co., 18 and 20 Cliff, N. Y.	2
Planes.	
Wrigging Machine Co., 106 Chambers, N. Y.	2
D. R. Barton Tool Co., Rochester, N. Y.	2
Greenfield Tool Co., Greenfield, Mass.	2
South Bend Rule & Level Co., Chambers, N. Y.	2
Plated Ware.	
Dorby Silver Co., Derby, Ct.	1
Clayton & Bro., 20 Broadway, N. Y.	1
Plows, Chilled Iron, Makers of.	
South Bend Iron Works, South Bend, Ind.	1
Plows, Cast Iron, Makers of.	
Pennsylvania Graphite Mfg. and Mfg. Co., Reading, Pa.	1
Plows, Plated Iron, Makers of.	
Baltimore Bell and Brass Works, 33 and 35 Holiday, Baltimore, Md.	1
Carr Wm. S. & Co., 106 Centre, N. Y.	1
Power Hammers, Makers of.	
Cortland C. & Co., Cortland, N. H.	3
Presses, Power, Makers of.	
Merriman A. H., West Meriden, Ct.	1
Peck Mfg. New Haven, Conn.	1
Pressure Blowers, Makers of.	
Clark & Fortaba, 1000 N. Philadelphia.	1
Printing Presses.	
Kelley Co., Meriden, Conn.	1
Pulleys, Friction.	
Mason Volney W. & Co., Providence, R. I.	1
Yocom & Son, Drinker, brook N. Y., Phila.	1
Pumps, Makers of.	
Bliss H., 194 9th, Brooklyn, N. Y.	1
Douglas W. B., Middlebury, Conn.	1
Runners, 1800, Fala, N. Y.	1
Runners Mfg. Co., 98 Chambers, N. Y.	1
Promoters.	
Brown Edward, 21 Walnut, Phila.	1
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Metzalf, Paul & Co., Pittsburgh, Pa.	1
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Lockport, 124 Baltimore, Md.	1
Boyers H. A., 19 John, N. Y.	1
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Cleveland Rolling Mill Co., Cleveland, O.	1
Lackawanna Iron and Coal Co., Scranton, Pa.	1
Milwaukee Iron Co., Milwaukee, Wis.	1
Razor Straps, Makers of.	
F. F. Badger & Son, Chateaufort, Mass.	1
Trylon Edward K. Jr. & Co., Phila.	1
Rivets.	
Thorn George, 151 Center, N. Y.	1
Timme's Son Peter, 251 North 4th, Brooklyn, E. D.	1
Road Scrapers, etc.	
Temple, 100 N. Louis, Mo.	1
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Moore James, Cor 16th and Broadway, Phila.	1
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Edmondson & Co., 70 Market, Phila.	1
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Diels E. C. & Co., Indianapolis, Ind.	1
Peace & Hogan, Williamsburg, N. Y.	1
Robert Jackson, 50 Chambers, N. Y.	1
Wherry, Madison & Cresswell, N. Y., Middlebury, N. Y.	1
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Casey, 100 N. 10th, Phila.	1
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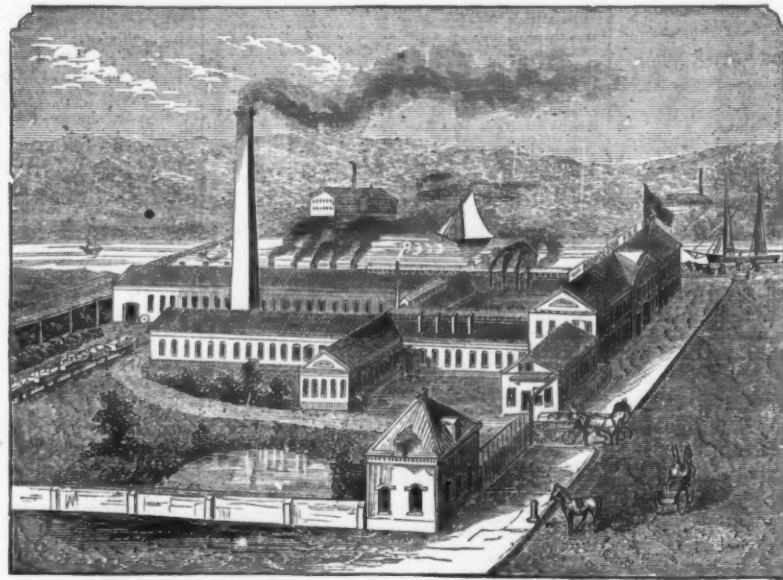
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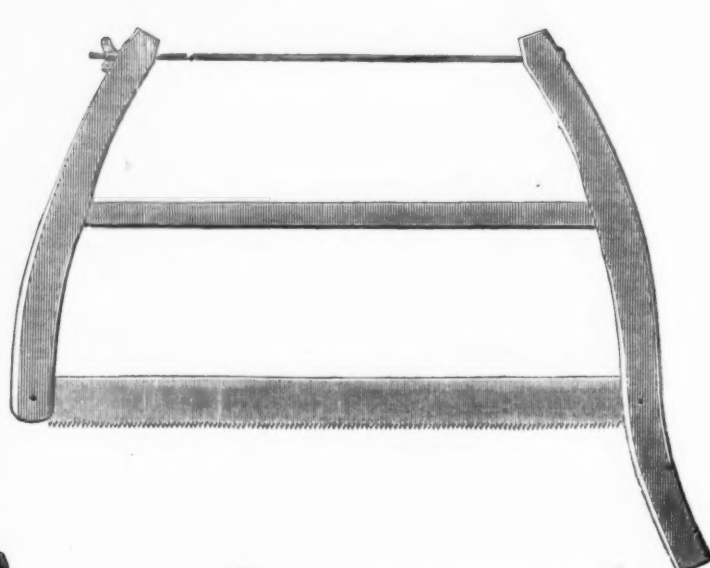
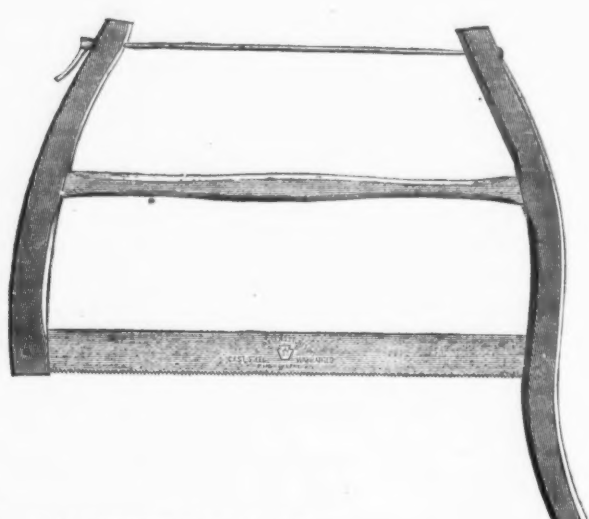
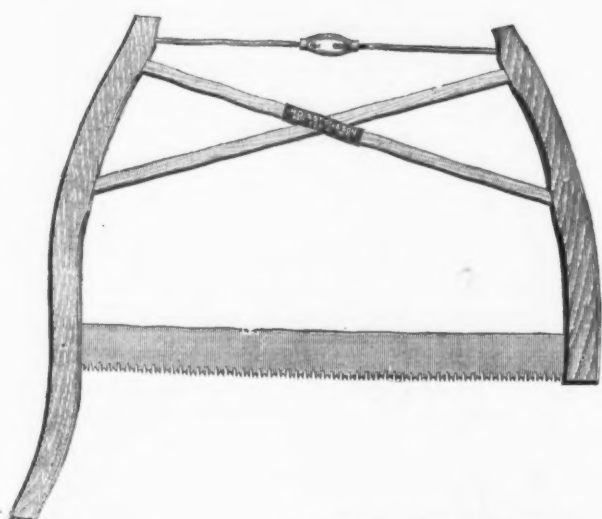
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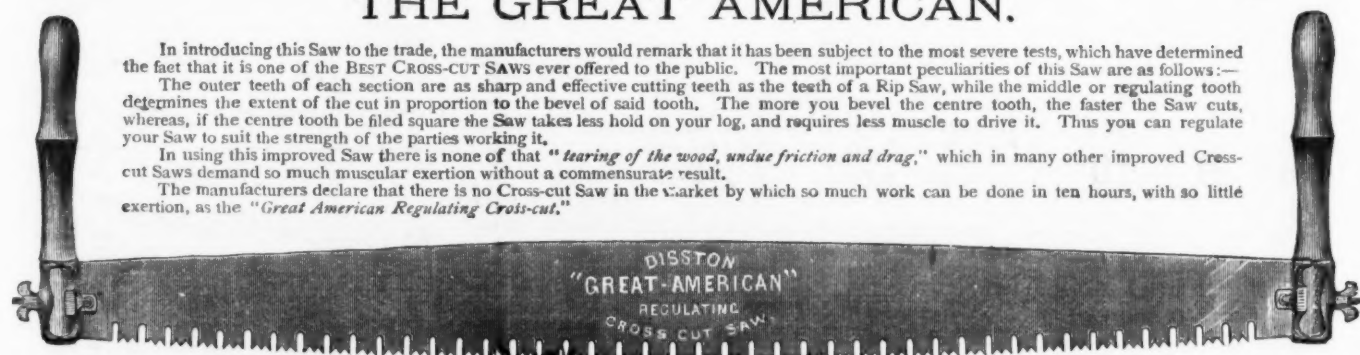
THE GREAT AMERICAN.

In introducing this Saw to the trade, the manufacturers would remark that it has been subject to the most severe tests, which have determined the fact that it is one of the BEST CROSS-CUT SAWS ever offered to the public. The most important peculiarities of this Saw are as follows:—

The outer teeth of each section are as sharp and effective cutting teeth as the teeth of a Rip Saw, while the middle or regulating tooth determines the extent of the cut in proportion to the bevel of said tooth. The more you bevel the centre tooth, the faster the Saw cuts, whereas, if the centre tooth be filed square the Saw takes less hold on your log, and requires less muscle to drive it. Thus you can regulate your Saw to suit the strength of the parties working it.

In using this improved Saw there is none of that "tearing of the wood, undue friction and drag," which in many other improved Cross-cut Saws demand so much muscular exertion without a commensurate result.

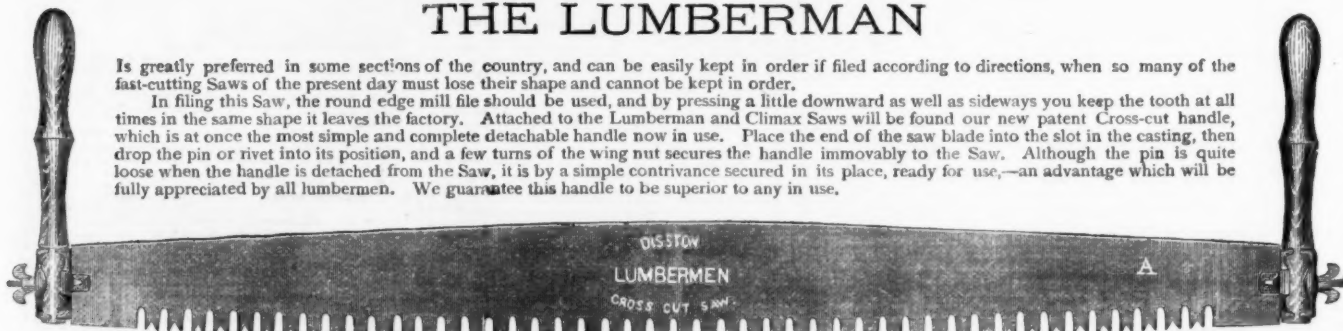
The manufacturers declare that there is no Cross-cut Saw in the market by which so much work can be done in ten hours, with so little exertion, as the "Great American Regulating Cross-cut."



THE LUMBERMAN

Is greatly preferred in some sections of the country, and can be easily kept in order if filed according to directions, when so many of the fast-cutting Saws of the present day must lose their shape and cannot be kept in order.

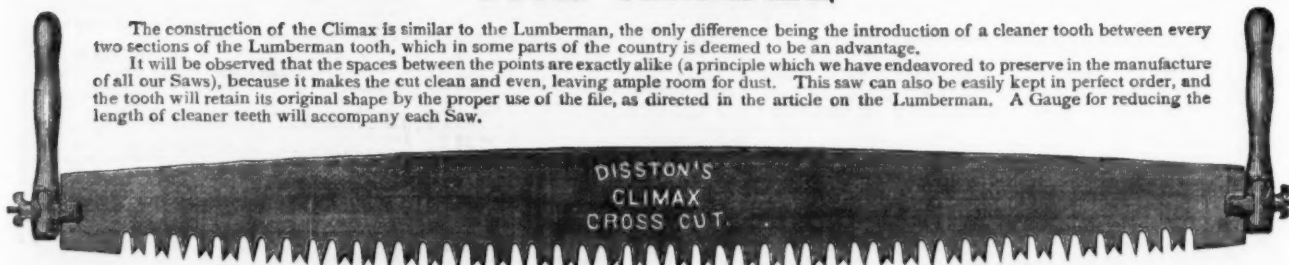
In filing this Saw, the round edge mill file should be used, and by pressing a little downward as well as sideways you keep the tooth at all times in the same shape it leaves the factory. Attached to the Lumberman and Climax Saws will be found our new patent Cross-cut handle, which is at once the most simple and complete detachable handle now in use. Place the end of the saw blade into the slot in the casting, then drop the pin or rivet into its position, and a few turns of the wing nut secures the handle immovably to the Saw. Although the pin is quite loose when the handle is detached from the Saw, it is by a simple contrivance secured in its place, ready for use,—an advantage which will be fully appreciated by all lumbermen. We guarantee this handle to be superior to any in use.



THE CLIMAX.

The construction of the Climax is similar to the Lumberman, the only difference being the introduction of a cleaner tooth between every two sections of the Lumberman tooth, which in some parts of the country is deemed to be an advantage.

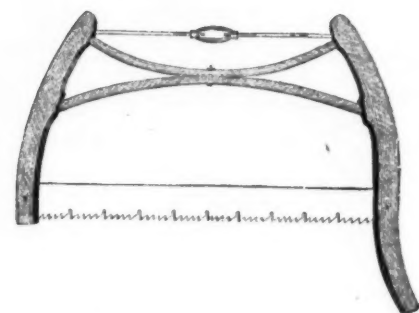
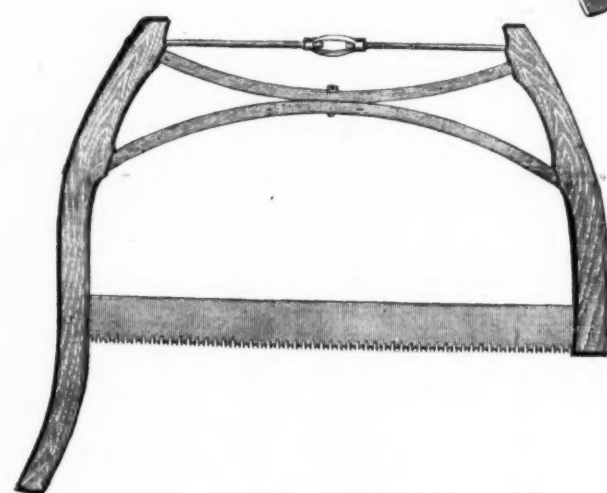
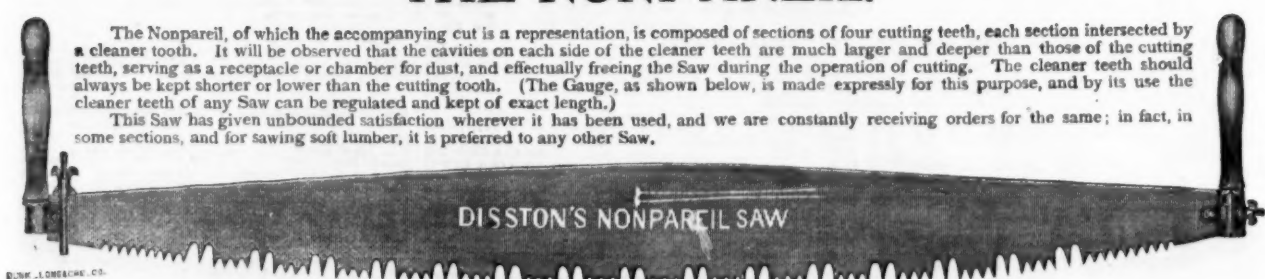
It will be observed that the spaces between the points are exactly alike (a principle which we have endeavored to preserve in the manufacture of all our Saws), because it makes the cut clean and even, leaving ample room for dust. This saw can also be easily kept in perfect order, and the tooth will retain its original shape by the proper use of the file, as directed in the article on the Lumberman. A Gauge for reducing the length of cleaner teeth will accompany each Saw.



THE NONPAREIL.

The Nonpareil, of which the accompanying cut is a representation, is composed of sections of four cutting teeth, each section intersected by a cleaner tooth. It will be observed that the cavities on each side of the cleaner teeth are much larger and deeper than those of the cutting teeth, serving as a receptacle or chamber for dust, and effectually freeing the Saw during the operation of cutting. The cleaner teeth should always be kept shorter or lower than the cutting tooth. (The Gauge, as shown below, is made expressly for this purpose, and by its use the cleaner teeth of any Saw can be regulated and kept of exact length.)

This Saw has given unbounded satisfaction wherever it has been used, and we are constantly receiving orders for the same; in fact, in some sections, and for sawing soft lumber, it is preferred to any other Saw.



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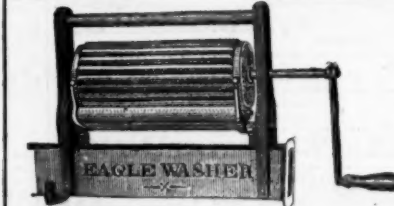
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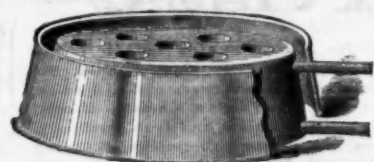
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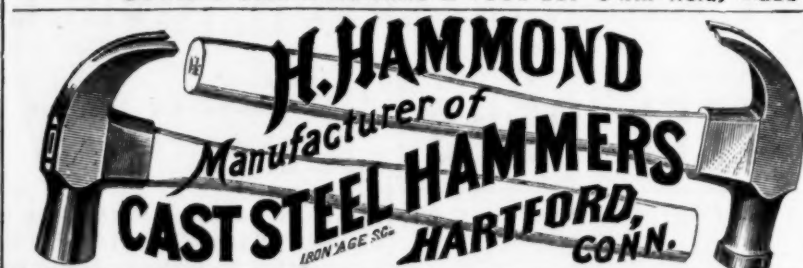
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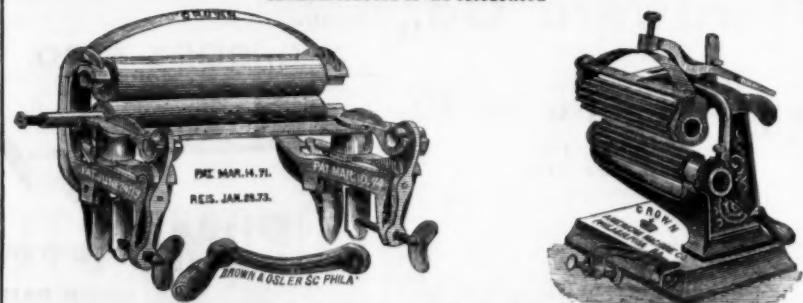
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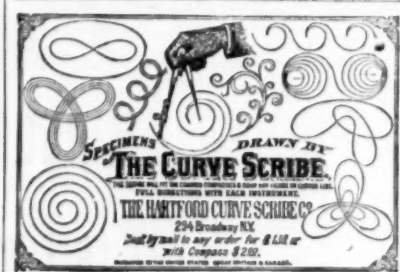
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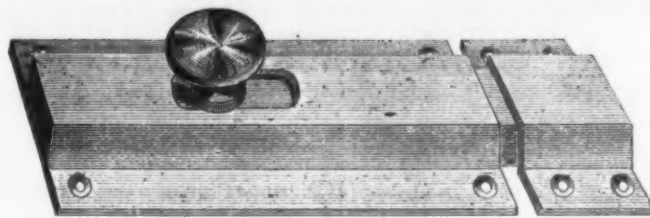
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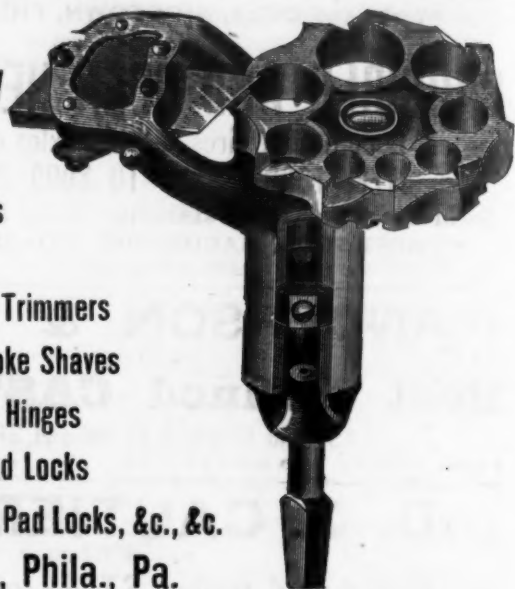
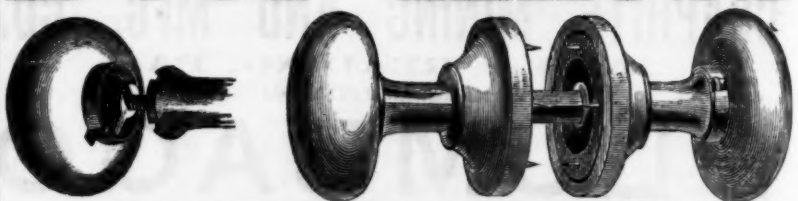
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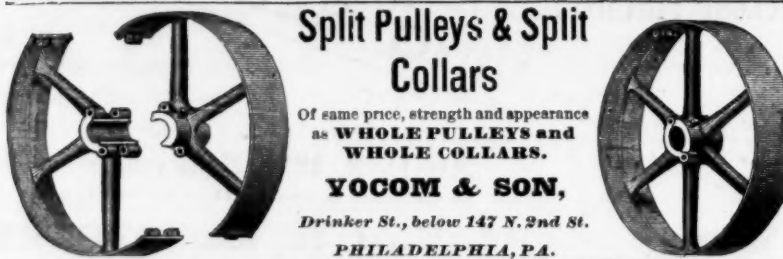
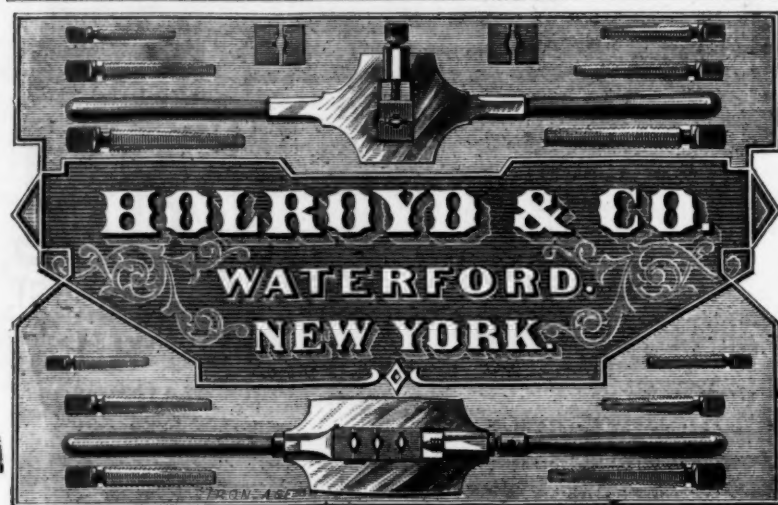
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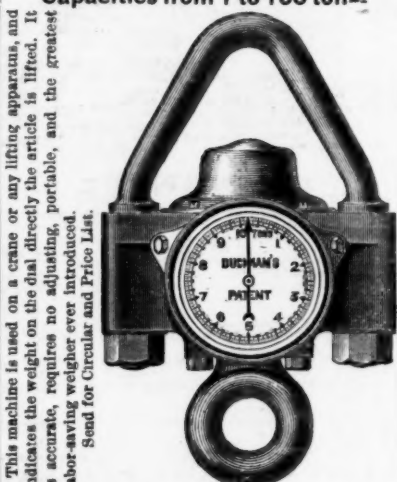
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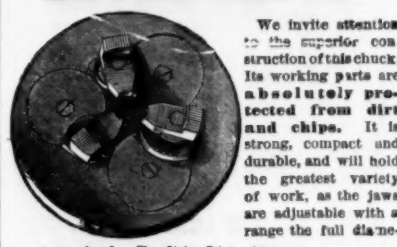
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JOHNSON'S PATENT UNIVERSAL LATHE CHUCK.

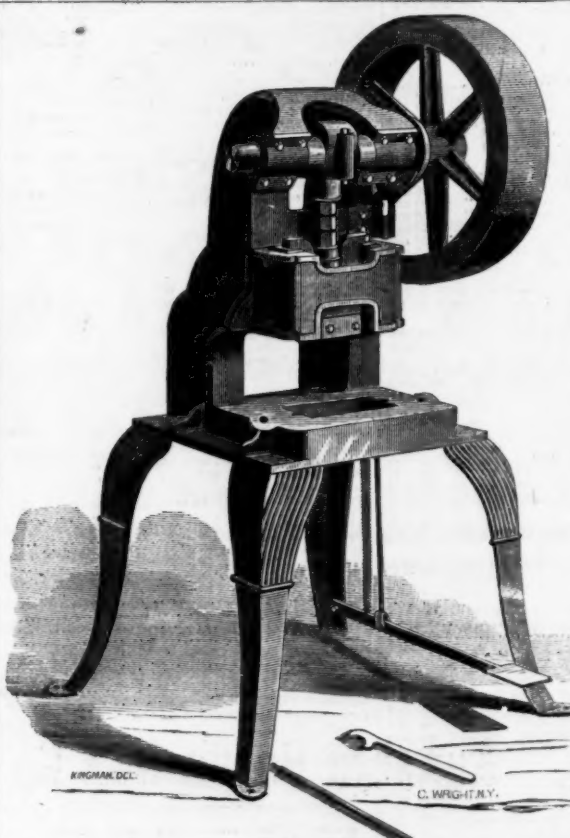


We invite attention to the superior construction of this chuck. Its working parts are absolutely protected from dirt and chips. It is strong, compact and durable, and will hold the greatest variety of work, as the jaws are adjustable with a range the full diameter of the chuck. For Price List address:

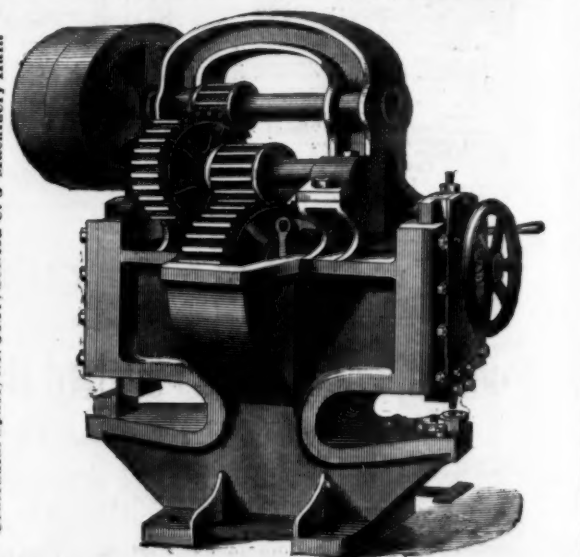
Lambertville Iron Works, Lambertville, N. J.
RIEHL BROTHERS,
Office and Works, N. 9th St., above Master, Phila.
Warehouses, 60 & 62 S. 4th St., above Chestnut, Phila.
New York Store, 38 Liberty Street.
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SCALE AND TESTING WORKS
ESTABLISHED 1846
"Patented" Furnace Charging Scale.
Double Beam R. R. Truck Scale, Compound Parallel Crane Beams, &c. Patented First Power Lever Wagon Scales. Testing Machines any capacity.
Send for Illustrated Price List.

C. A. & W. L. TEAL,
Manufacturers of
IMPROVED BOILER PLATE BENDING ROLLS,
Arranged for removing work from the end of top roll.
Boiler-Plate Flanging Machines, Combined Punching and Shearing Machines and Single Power Punching Machines,
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Manufacturers of all kinds of
PRESSES, DIES, & SPECIAL MACHINES,
FOR WORKING SHEET METALS, &c.
167 to 173 Plymouth Street, Cor. of Jay, Brooklyn,





TO ALL WHO USE STEAM-POWER!

We will put our Governor on any Engine, and guarantee it to prove itself superior to all others.

If, after a fair trial, it does not, we will take it off at our own expense.

Shive Governor Co.
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CLOCK AND DETECTOR,

Buoy's Patent Counter Scale,
No Nest of Weights.

Circulars sent free

THE JUDSON GOVERNOR.

It is a common method to advertise Governors without cost, unless satisfactory to the customer, and then charge High Prices for doing what any good Governor will do. Various Governors inferior to the "Judson" are sold in this way, operating well enough for three months, to insure collection of the pay, but becoming useless after a year's wear—their construction lacking durability. The Judson Governor is guaranteed to be not only the best Regulator of steam Engines, but also the most durable Governor made. Parties in buying other Governors should stipulate that their durability be guaranteed, and should also take care that they do not, for much inferior Governors, pay higher prices than those shown in the accompanying list. We guarantee the Judson Governor will do all any other Governor can do, and in Accuracy and Durability—the main essentials—we guarantee it shall do more.

Reduced Price List,

JANUARY 25th, 1876.

For dimensions of Governor, see Illustrated Price List.



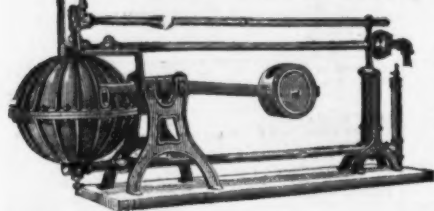
THE JUDSON PATENT Improved Steam Governor.

Size, Inch.	Plain.	Bright Finish.	Extra for Lever.	Stop Valve.
1	\$17.00	\$19.00	\$1.90	..
1 1/2	19.00	21.00	2.10	..
2	21.00	24.00	2.40	\$5.00
2 1/2	25.00	28.00	2.80	6.00
3	29.00	33.00	3.30	8.00
3 1/2	35.00	40.00	4.00	10.00
4	42.00	48.00	4.80	14.00
4 1/2	45.00	51.00	5.10	15.00
5	49.00	56.00	5.60	17.00
5 1/2	55.00	63.00	6.30	20.00
6	64.00	73.00	7.30	25.00
6 1/2	74.00	84.00	8.40	30.00
7	86.00	97.00	9.70	35.00
7 1/2	94.00	106.00	10.60	42.00
8	112.00	125.00	12.50	48.00
8 1/2	125.00	138.00	13.80	54.00
9	150.00	165.00	16.50	68.00
9 1/2	165.00	182.00	18.20	80.00
10	205.00	225.00	22.50	..

No Charge for Box and Cartage.

JUNIUS JUDSON & SON, Rochester, N. Y.

The Albany Steam Trap.



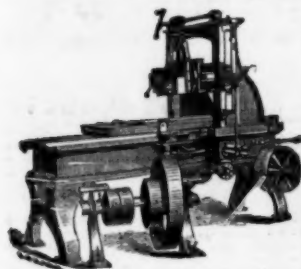
This Trap automatically drains the water of condensation from Heating Coils, and returns the same to the Boiler whether the Coils are above or below the water level in Boiler, thus doing away with pumps and other mechanical devices for such purposes. Apply to

Albany Steam Trap Company,
Albany, N. Y.

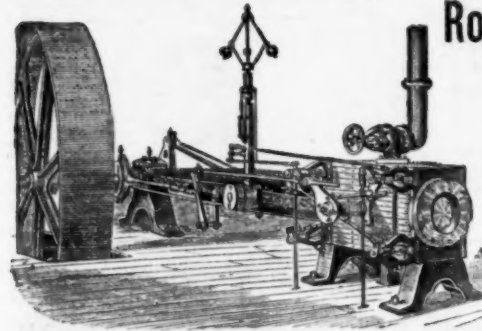
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Have constantly on hand and making

Drop Hammers



Of recently improved construction. Pony Trip Hammers, Blacksmiths' Sheaves, Broaching and Stamping Presses, Iron Shop Cranes, Machinists' Tools, Gun and Sewing Machine Machinery. Make to order Gray and Charcoal Iron Castings of all styles and sizes not exceeding 15 tons weight, (making patterns if desired). Furnish Clamp Pulleys of light patterns, cut gears in a superior manner, &c., &c.



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CHESTER, PA.

Corliss Engine
BUILDERS.

Shafting & Gearing,
Boiler Makers.

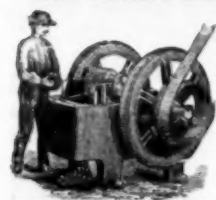
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PORTABLE DRILLS. Driven by power in any direction.
RADIAL DRILLS. Self-feed—Large Adjustable Box Table.
VERTICAL DRILLS. Self-feed.
MULTIPLE DRILLS. 2 to 20 Spindles.
HORIZONTAL BORING AND DRILLING MACHINES.
HAND DRILLS. CAR BOX DRILLS.
SPECIAL DRILLS. For Special Work.

BLAKE'S PATENT STONE & ORE BREAKER.

New Pattern with Important Improvements & Abundant Strength



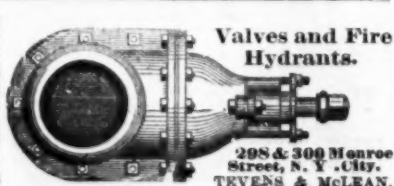
For reducing to fragments all kinds of hard and brittle substances, such as STONE for making the most perfect MACADAM ROADS, and for making the best CONCRETE. It breaks stone at trifling cost for BALLASTING RAILROADS. It is extensively in use in MINING operations, for crushing

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Also for crushing Quartz, Flint, Emery, Corundum, Feldspar, Coal, Barytes, Manganese, Phosphate Rock, Plaster, Soapstone, &c.
For Illustrated Circulars, and particulars, address.

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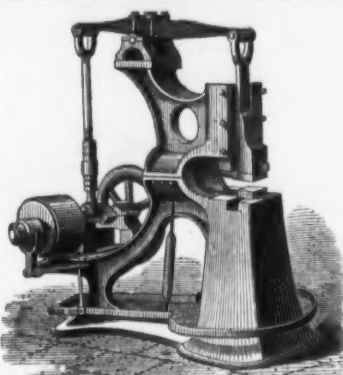


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298 & 300 Monroe St.,
New York,
AGENTS.



Valves and Fire
Hydrants.

298 & 300 Monroe
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THE PALMER POWER SPRING HAMMER.



THE "ABBE" BOLT HEADER

Of these Machines we are building sizes to meet the requirements of all Manufacturers and Workers of Iron and Steel. In simplicity, durability, ease of operation, accuracy, and range of work, we guarantee them superior to any Machines of their kind produced in the world. For prices, references, and full descriptive circulars, address

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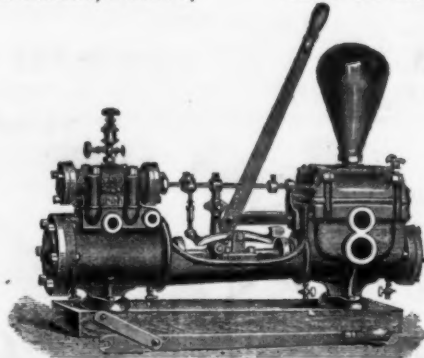
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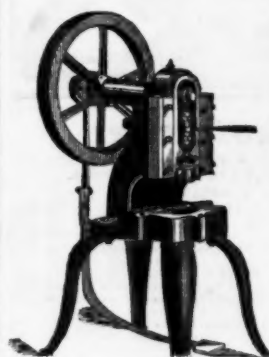
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Cut above represents regular Boiler Feed Pump, No. 3 and 4. Showing New Patent Valve Motion, and Hand Power LEVER Attached and Detached.

FIRE PUMPS a specialty.

Mining Pumps (both Double Acting Plunger, and Piston Pattern,) which we guarantee to run absolutely noiseless on any lift from 100 to 600 ft., at a single lift, a specialty. Pumps for every possible duty. Prices as low as any, and our workmanship and material altogether the Best. Every machine furnished under a complete guarantee.



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Punching Presses.

Patentee and Sole Manufacturer.

I warrant every part of this Machine to stand the shock of the wheel running at 125 revolutions.

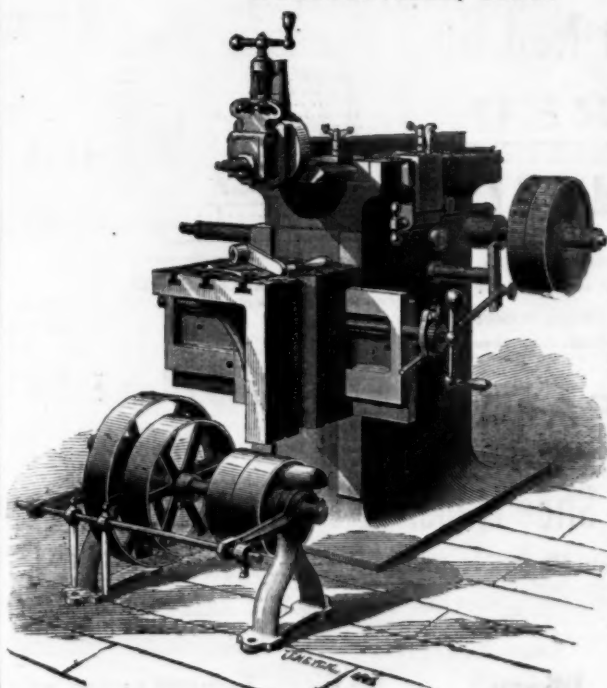
West Meriden, Conn.

Machinery Hall, Philadelphia, Section B 4, Columns 28 and 29.

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MANUFACTURERS OF

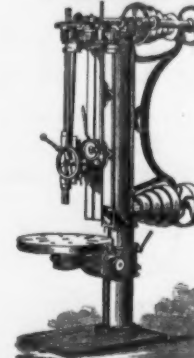
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Patent Planers and Shaping Machines.
WOLCOTTVILLE, CONN.



Any length of stroke from 3/4 to 24 inch in length, while machine is running with perfect uniformity of speed of cutting tool. Automatic cross feed of 19 inch and 16 inch, from top of table to bottom of slide when table is down. Send for Circular and Price List.

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The Frazer Axle Grease and Lubricator.

A pure Lubricator, free from water, gum or sediment. The best article made for Wagons, Open Journals, Cog Wheels, Rollers and wherever a Solid Lubricator or Grease can be applied. Put up in Boxes, Kegs and Barrels. For prices see New York Price List in this paper. Established 10 years.

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SAFEST, CHEAPEST & BEST.

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Sole Manufacturers
Engines, Boilers and
Steam Pumps.

The Almond Drill Chuck

THE BEST DRILL CHUCK IN
THE MARKET.



Is Simple in Construction, Self
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Will hold, with a perfectly tight
grip, from 5-16 to 0, and weighs but
12 oz.

Price, \$5.00 each.
Liberal discounts to the trade.

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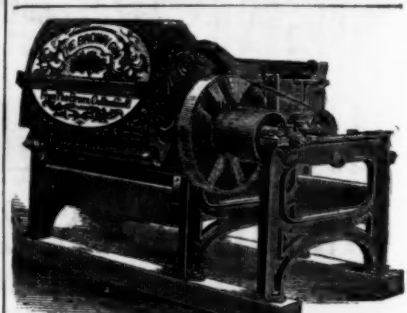
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OHL & HAUSCHILD, Engineers & Machinists

And manufacturers of

Lathes, Shapers, Slotters, Planers, Gear Cutters,
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Manufacturers of

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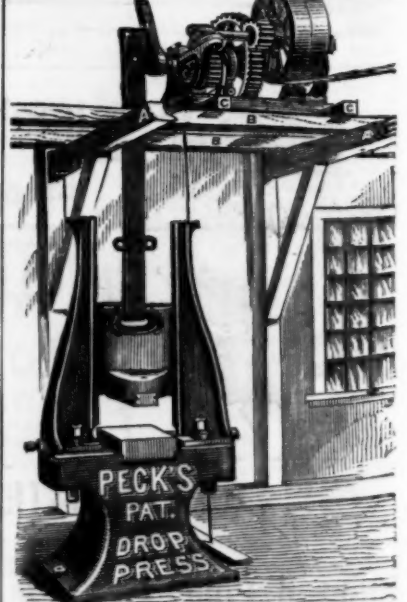
With or without

Self-Feeding Attachment & Condenser.

Cotton Gin Saws, Ribs and other Gin materials. Also

Liberty's Segments, Screw Cotton, and Key

Press. Send for Circular.



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PAT.
DROP
PRESS

I have the largest and best stock of Drop Press
Patterns in the country—suitable for Ferging, and all
kinds of Sheet Metal work.

WHY THE BEST:

It requires less power, works faster, gives a harder blow
with same weight of hammer, the rebound of the ham-
mer is caught without lessening the force of the blow,
the blow is uniform and not affected by variations in
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Drop Press a specialty.

MILO PECK, New Haven, Conn.

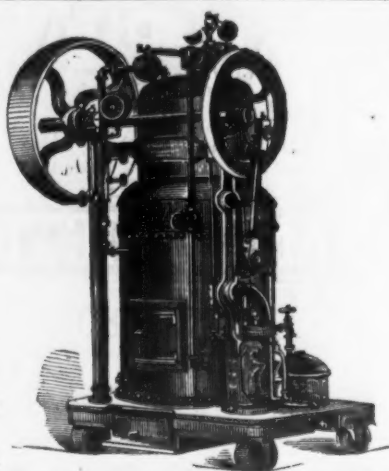
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THE
Shapley Engine

Patented Feb. 10, 1874.

COMPACT,
PRACTICAL,
DURABLE,
ECONOMICAL.
\$200.00.Cheaper than any Engine offered of
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SHAPLEY & WELLS,
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CASTINGS of every description.

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BUILDERS OF
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MILL WORK
GENERALLY.
Special Machinery
BUILT TO ORDER.

Vertical and Horizontal
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Two First Premiums awarded by Franklin Institute Exhibition of 1874.

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Send for Descriptive Circulars.OVER 300 IN SUCCESSFUL OPERATION.
The "Dead Stroke"
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With Belden's Recent Improvements.

Guaranteed the best in Every Essential. Takes Less Room,
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or no pay.

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Machinists' Tools & Special Machinery.

THE "CLIMAX" PIPE WRENCH,

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(Recently improved and reduced in price.)

Hardware Specialties to Order. Models, Dies and

IRON & STEEL DROP FORGINGS.

Machinery, &c.

Established 1848.

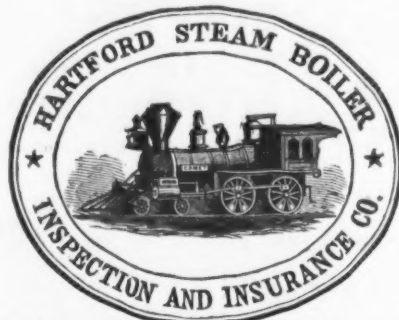
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Engineers, Iron Founders and Machinists.
RAILWAY SHOP EQUIPMENTS.Our Steam Hammers, Lathes, Planers, Drills and Bolt Cutters
Are of Improved and Patented Construction.Railway Turning and Transfer Tables,
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Issues Policies of Insurance after a careful Inspection of the Boilers

COVERING ALL LOSS OR DAMAGE TO

Boilers, Buildings and Machinery,

ARISING FROM

STEAM BOILER EXPLOSIONS.

The Business of the Company includes all kinds of STEAM BOILERS
Full information concerning the plan of the Company's operations can be obtained at theCOMPANY'S OFFICE, HARTFORD, CONN.,
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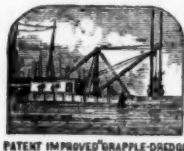
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Board of Directors:

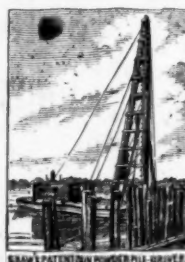
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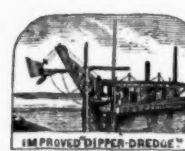
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PATENT IMPROVED GRAPPLE-DREDGE.



SAW/PATENT PULVER-PUL-DREDGE.



IMPROVED "DIPPER-DREDGE".

BUILDERS OF STEAM DREDGING MACHINES,
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Offices, No. 10 South Delaware Ave., Philad'a.



Keystone Pressure Blowers.

Anti-friction and noiseless; maximum blast and minimum power;
all sizes for

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ALSO
KEYSTONE EXHAUST BLOWERS.

Made on same principle.

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Blower guaranteed. Send for circular, or
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Hydraulic Jacks and Punches.

ROLLER TUBE EXPANDERS

And Direct-Acting Steam Hammers.

Communications by letter will receive prompt attention.

JACKS for Pressing on Car Wheels or CRANK PINS made to order

Machinery, &c.



REPORT OF JUDGES

In Department F, Group 3, at the 44th

Exhibition of the

AMERICAN INSTITUTE,

Held in the City of New York, Oct., 1875.

No. 318, Drawing, Drop &
Punching Presses.THE STILES & PARKER PRESS CO.,
Of Middletown, Conn.The machinery exhibited by these makers is of a
character that calls for special commendation. In
addition to their well known punching presses, to
which a new feature has been added in a press ad-
justable to an inclination for discharging work left
above the die, there are exhibited by them a com-
bined punch and shears, a drawing or blanking press,
and a drop.In all these there is shown the highest mechanical
culture, applied to meet every practical requirement,
to avoid every practical difficulty, and to enlarge the
range of application of the machines, by devices
which are at once simple, elegant, and effective.
Your committee would unhesitatingly recommend
for this exhibition the "Medal of Progress," but
find such award debarred by the rule of the Institute,
forbidding such award unless a Silver Medal has
been previously awarded. We, therefore, respect-
fully recommend the award of a Silver Medal.

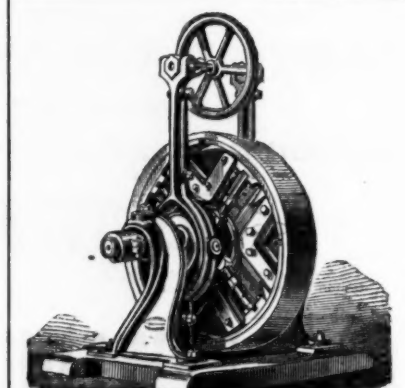
Silver Medal Awarded.

A true copy from the Report on file.

JOHN W. CHAMBERS, Sec'y.

AQUOMETER
Steam Pump.Highest Premium awarded by
Franklin Institute, 1874.
For Simplicity, Economy of
Construction & Efficiency.An absolutely Durable, Cheap, Efficient and Eco-
nomical Steam Pump. Requires no special care or
lubricating. Warranted. Address for circular,AQUOMETER STEAM PUMP CO.,
10 South Dela. Avenue, Philadelphia,

EUREKA SAFETY POWER!

Practically impossible to
explode. Tested to 30 lbs.
pressure per square inch. Will
lift 3 inch seasoned oak—grind 5
bushels corn per hour. Price
\$250. Also, Stationary Engines
and Boilers and Spark Arres-
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plantation use. Send for our cir-
cular. Discount to the trade.B. W. PAYNE & SONS,
Corning, N. Y.

VOLNEY W. MASON & CO.,

Manufacturers of PATENT

FRICTION PULLEYS,

Friction Clutches

For Connecting Shafting and Gearing,

ELEVATORS.

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All patents are published in the Scientific American
the week they issue. Send for Pamphlet, 16 page
containing laws and full directions for obtaining
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Munn & Co., 37 Park Row, New York,
Branch Office, cor. F and 7th Sts., Washington, D. C.

TUBAL SMELTING WORKS,

760 South Broad Street, PHILADELPHIA.
PAUL S. REEVES,
MANUFACTURER OF

ANTI-FRICTION METALS.

XXX Genuine.....40c
XX.....35c
X.....30c
H.....25c

C.....90c
D.....85c
E.....80c
F.....75c

Note.—The above are my standard mixtures, and have given satisfaction wherever used, but I am prepared to make Anti-Friction Metal of any quality or mixture desired by the purchaser.

BRASS CASTINGS, 11 to 35c. INGOT BRASS, 19 to 25c. BRASS TURNINGS AND OLD METALS WANTED.

ESTABLISHED 1842.

WM. & HARVEY ROWLAND,

PHILADELPHIA,

P. O. Address: Frankford, Philad'a. MANUFACTURERS OF ALL KINDS OF

Elliptic, Platform AND C Springs,

MADE EXCLUSIVELY FROM

SWEDISH STOCK, OIL-TEMPERED and WARRANTED.

Swedish Tire, Toe, Blister and Spring Steel.

CAST SPRING AND PLOW STEEL.
CAST SHOVEL, HOE AND MACHINERY STEEL.

OXFORD TOE, SLEIGH, TIRE AND SPRING STEEL.
BESSEMER SHOVEL AND PLOW STEEL.
BESSEMER MACHINERY AND CULTIVATOR STEEL.

RE-ROLLED NORWAY SHAPES.
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